February, 1948

EDISON ELECTRIC INSTITUTE BULLETIN

APR 5 1948
ECONOMY, RESOURCES & INDUSTRY

Electric Power Supply to Farm Customers 33

Joint AEIC-EEI Heat Pump Committee Suggests Method for Ground Temperature Measurements 35

Recent Developments in Dry Type Transformers for Submersible Service . . . . . W. W. SATTERLEE 37

Industrial Management Institutes Sponsored by University of Wisconsin J. D. HOWARD 41

New Uses and Applications of Electric Service 42

Final Progress Report—Fundamental Investigation of Graphitization of Piping 43

Joint Accounting Conference at St. Louis, Missouri, April 12-14, 1948 . 45

The Inspection, Testing and Maintenance of Electrical Equipment for Stations and Substations . . A. C. BAUMANN and R. H. MERTZ 47

Twenty E.E.I. Resuscitation Medal Awards Earned by Alert Power Co. Employees . . . . . MAE B. WOODS 51

Electrical Equipment Committee Meeting . . . . C. A. CORNEY 60

Meter and Service Committee Meeting . . W. G. KNICKERBOCKER 61

Accident Prevention Committee Meeting . . . . . E. J. KREH 61

Personals 62

Conventions and Meetings 64

PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

November, 1946-1947

SOURCE AND DISPOSAL OF ENERGY - MONTH OF NOVEMBER			
GENERATION* (Net)	1947	1946	%
By Fuel Burning Plants	15,762,949,000	13,668,701,000	+15.3
By Water Power Plants	6,084,051,000	6,280,383,000	- 3.1
TOTAL GENERATION	21,847,000,000	19,949,084,000	+ 9.5
Add — Net Imports Over International Boundaries	76,830,000	87,171,000	-11.9
Less-- Company Use	131,207,000	129,436,000	+ 1.4
Less-- Energy Used by Producer	288,722,000	369,468,000	
NET ENERGY FOR DISTRIBUTION	21,503,901,000	19,537,351,000	+10.1
Losses and Unaccounted for	2,777,743,000	2,603,862,000	+ 6.7
SALES TO ULTIMATE CUSTOMERS	18,726,158,000	16,933,489,000	+10.6
CLASSIFICATION OF SALES			
NUMBER OF CUSTOMERS - As of November 30th			
Residential or Domestic	31,469,541	29,650,918	+ 6.1
Rural (Distinct Rural Rates)	1,505,100	1,365,250	+10.2
Commercial or Industrial			
Small Light & Power	4,948,279	4,677,325)	+ 5.9
Large Light & Power	191,025	174,604)	
Other Customers	134,995	121,010	+11.6
TOTAL ULTIMATE CUSTOMERS	38,248,940	35,989,107	+ 6.3
KILOWATTHOUR SALES - During Month of November			
Residential or Domestic	3,876,006,000	3,413,511,000	+13.5
Rural (Distinct Rural Rates)	382,314,000	327,523,000	+16.7
Commercial or Industrial			
Small Light & Power	3,346,373,000	2,943,999,000	+13.7
Large Light & Power	9,757,170,000	8,907,819,000	+ 9.5
Street and Highway Lighting	233,716,000	221,952,000	+ 5.3
Other Public Authorities	501,638,000	460,186,000	+ 9.0
Railways and Railroads			
Street & Interurban Railways	359,275,000	386,934,000	- 7.1
Electrified Steam Railroads	218,568,000	222,323,000	- 1.7
Interdepartmental	51,098,000	49,242,000	+ 3.8
TOTAL TO ULTIMATE CUSTOMERS	18,726,158,000	16,933,489,000	+10.6
REVENUES FROM ULTIMATE CUSTOMERS	$ 335,687,200	$ 300,599,300	+11.7
RESIDENTIAL OR DOMESTIC SERVICE			
Average Customer Data - for 12 months ended November 30th			
Kilowatthours per Customer	1,426	1,319	+ 8.1
Average Annual Bill	$44.21	$42.74	+ 3.4
Revenue per Kilowatthour	3.10¢	3.24¢	- 4.3

(*) By Courtesy of the Federal Power Commission

Vol. 16, No. 2, EDISON ELECTRIC INSTITUTE BULLETIN; published monthly. Entered as second-class matter Aug. 17, 1933, at the post office at Philadelphia, Pa., under the act of March 3, 1879. Publication office, 56th and Chestnut Sts., Philadelphia 39, Pa. Editorial office, 420 Lexington Ave., New York 17, N. Y. Subscription rate $2.00 per year in the United States; $3.00 per year in foreign countries.

The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the BULLETIN.

EDISON ELECTRIC INSTITUTE BULLETIN

Volume 16 FEBRUARY, 1948 No. 2

Electric Power Supply to Farm Customers

A Review of the Situation Today

YEAR end reports from all but the very smallest companies in the country show that with very minor exceptions the power requirements of all farm customers of the companies, both wholesale and retail, were supplied through 1947. Reports showed that the power companies, which supply 500 of the approximately 900 REA cooperatives, met all their contractual obligations and took on a substantial number of REA contracts where municipal systems or very small companies had not been able to take care of the growth of load on their own systems and on the REA cooperative systems as well. Only in five cases were companies not able to accept without deferment additional REA contracts for power, although shortage of materials for building transmission lines and substations, both on the part of the cooperatives and of the companies introduced a delay in cases where the transmission distance was considerable.

Farms Get Full Supply

Where the companies saw themselves short on reserves during peak load periods or drouth periods, they made cooperative arrangements in advance with industrial customers to shift the hours of use off the peaks and to cut off interruptible power to assure the fact that the supply of power to the vast majority of the customers would not be affected. The reports have certainly shown that the companies were especially careful to assure a full supply of power to the farms.

The following facts and figures readily show why the power industry, in most instances, could assure a full supply of power to the farms in 1947 and will be able to do so in the future. The 6 billion kwhr sold to about 3,800,000 electrified farms, leaving out 3 billion sold for pumping which also was supplied, represented only 3 per cent of the power sold to all consumers in the United States; whereas the power sold to industry represented about 50 per cent of the total sales. Hence it can be seen that only in the exceptional situation is a company unable to take care of all the power needs of its farm customers, both wholesale and retail.

Rate of Growth

The rate of growth of electricity demand over the entire country since World War II has exceeded our expectations, not that the industry could have installed equipment any faster than it did, because orders for equipment beyond the limit of the manufacturing capacity of the country have been in the hands of the electrical manufacturers since before V-J Day, but only 190,000 kw was delivered and installed in 1946 and not until the second quarter of 1947 did generating equipment deliveries begin to pour out from the factories.

In some areas the rate of growth has been exceptionally high, notably in the Southwest, in the Michigan-Illinois territory, in the Northwest, in California and in the Southeast.

There are now two pronounced peak load seasons, one in July and August, which is usually a morning peak lasting from 8 to 10 a.m., and the other peak load season in December, a lighting peak from 5 to 6 in the afternoon. This year so far the cold weather combined with a shortage of fuel gave rise to demands in January of about the same magnitude as the December peak.

The margin of capacity over noncoincident peak load in December, 1947, was 5 per cent. Due to interconnections and well coordinated operations, there was practically no curtailment or voltage reduction during the December peak load season. That small voltage reduction and curtailment which was in operation was of a precautionary nature by companies not knowing how high the peaks might go.

Actually more trouble was experienced in carrying the summer peaks of 1947 than the December peak because at that time there was more scheduled outage of equipment for maintenance and because of the very hot weather which resulted in more cable and transformer failures. Also in some areas water for hydro plant was short, and high temperature of cooling water, of course, lowers somewhat the efficiency of steam plants.

Installation of Generating Equipment

The deliveries of generating equipment and other types of equipment are now much better. Latest information shows that there were delivered approximately 3 million kw of steam and hydro capacity in 1947, of which about 2 million was installed and about 1 million was in process of installation at the year end.

The manufacturers expect to deliver in 1948 a total of 5,250,000 kw, and the industry expects to install during the year nearly 5 million kw, against an estimated peak load growth of 3½ million. The 5 per cent margin of reserves at the end of 1947 is expected to be about 8 per cent at the end of 1948. Of course, bad drouth conditions can hurt that outlook in specific localities. On the other hand, should a depression develop, of course, the margins of capacity over peak load would become considerably larger than those given here.

Our studies indicate that in the territory west of the Mississippi and east of the Rocky Mountains from Canada to

the Gulf of Mexico there will be narrow reserves of generating capacity in most of the area during 1948. The situation will be generally improved, however, over 1947 and the estimates indicate that the load will be carried in every area, except perhaps in some small systems from which we have no reports. The operating forces, however, will be under tension to keep every generating unit ready to function at all times, as was the case last year.

"Comfortable" Reserves in 1949

The estimates indicate that all over the United States there will be more comfortable reserves by 1949. By comfortable it is meant that operating forces will have more leeway to plan their maintenance and deal with unforeseen outages. By 1951 it is expected that normal reserves (15 per cent) will have been restored.

At the end of 1947, installed capacity had risen from 50,300,000 to 52,211,000 kw, there were a million kw in process of installation, and orders for generating equipment amounted to approximately 18 million kw, of which 16 million were steam units. Of the approximately 21 million kw installed or to be installed since the war, the electric utility companies will provide about 18 million kw.

Backlog of Applications

A year ago the companies had a backlog of applications for service of approximately 400,000 in the rural areas. Shortage of wires, insulators, transformers, poles and labor caused this backlog. During the year, according to our information, much of the backlog was caught up with, although not all of it. However, the supply of materials has been improving for several months.

Extension of Rural Service

The extension of service in rural areas by the power companies in their service areas has been very considerable. At the end of 1947 they were serving about 2,095,000 farm customers. REA cooperatives were serving about 1,525,000 customers and municipalities and districts were serving about 205,000, making a total of 3,825,000 farms served. Three years ago the companies launched on a three-year program to serve an additional 560,000 farms. Preliminary figures indicate that in two years they have added 385,000 farms net. The gross figure was higher but there have been several thousand farm customers removed from the companies' lists through acquisitions by districts and by cooperatives. The companies' construction program for 1948 indicates that they will be serving an additional 160,000 farms, bringing the three-year total to approximately 545,000.

In the service areas of many companies, the number of farms to be reached is becoming small, approaching saturation.

It is gratifying to find from statistics that in many areas the number of farms along existing lines not taking service is being considerably reduced. This is particularly true in the East North Central and West North Central areas. The total number of farms reached but not taking service is now estimated to be about 750,000. The number of customers picked up along existing lines in 1947 was about 95,000. The farms reached by new lines built during the year and not taking service offset about a third of this gain. Electricity had been brought to about 4,550,000 farms at the end of 1947. Preliminary estimates indicate that another 450,000 farms will be connected in 1948, bringing the year-end figure to 5,000,000 or about 90 per cent of the number of occupied farms as reported in the last Census.

Customer Use

There is a satisfactory increase in the use of electricity per customer notwithstanding the number of new customers in recent years which tends to pull down the national average. It has now climbed to about 1855 kwhr per customer in the territory east of the 100th meridian. This is 83 per cent more than it was ten years ago. The 1946 figure was 1669 kwhr. In Massachusetts, Connecticut, New Jersey, Idaho, Oregon and Washington, farms are using over 3000 kwhr, and in many states in New England, Middle Atlantic States and East North Central area, average uses of 2400 and 2500 kwhr are prevalent. Our rural service committees are estimating average farm uses in these areas of 4000 to 6000 kwhr per customer in another ten years.

Farm Sales

Preliminary figures for 1947 indicate that the total farm consumption of electricity that year was over 9 billion kwhr, an increase of 25 per cent over the previous year. The electric companies are manning their organizations to build up and promote profitable use of electricity on the farm. They are anxious to work with other organizations interested in this same subject, a subject we all recognize to be of vital interest to this nation.

New England Electric Publishes Employee Manual

A FULL scale color-map showing all company installations; an eight-page photo section showing important company substations and other plants; two strikingly illustrated charts depicting important processes in the power industry,. plus a well written and illumined text are featured in "On the Job With New England Electric System," an employee manual recently distributed to employees of the system.

Beginning with a dedication to new and old employees by Irwin L. Moore, president of the company, the first four of the manual's 44 pages are devoted to a detailed history of the organization.

Following this is a list of the company's 42 operating companies, together with an explanation of how they operate, fully outlining system standards, telling about system laboratories and giving the latest facts about the 1947 development of the organization.

After the brilliant eight-page photo section, comes a part devoted to facts employees should know about their jobs. Benefits, rights, duties, a retirement plan and the system's educational and student training programs are fully outlined here.

Safety, all important in the operations of any electric light and power company, with the company requirements and course offered employees by the company is then alloted several pages.

Concluding the manual are three charts, portraying the total revenue for gas and electricity; total investment of plant and equipment for gas and electricity; total gross output of kwh, and two diagrams showing steps in the production, transmission and distribution of electricity as well as diagrams showing steps in the manufacture of coal gas and carburated water gas.

Joint AEIC-EEI Heat Pump Committee Suggests Method for Ground Temperature Measurements

IN ORDER to check the operation and to determine the performance coefficient of heat pump systems using ground as a heat source, it is usually helpful to have some idea of the seasonable variation in the ground temperatures at various depths. The normal ground temperature for any given geographic area will be affected, among other things, by the minimum and maximum air temperatures, as illustrated in Fig. 1, for Pittsburgh, Pa. The data for this figure was compiled by the ASHVE Research Laboratory in connection with heat loss studies through basement walls and floors.*

Most of the methods now being used for ground temperature measurements require expensive testing equipment resulting in rather costly installations. The comparatively inexpensive method described here was devised by the Connecticut Light and Power Company and has been found to be sufficiently satisfactory and accurate for all practical purposes.

* *Heating, Piping and Air Conditioning*, January, '42.

Method Used by Connecticut L & P

With increased interest in the earth as a source of heat and as a sink for heat disposal for use with the heat pump, the first question asked is—"What is the temperature of the ground?" Since ground temperatures vary with depth below surface, season and latitude, some inexpensive method of obtaining this information seemed called for. The Connecticut Light and Power Company devised the following system which has proved satisfactory.

It was found that mercury-in-glass thermometers, lowered on a string into tubes buried to predetermined depths, gave sufficiently accurate measurement. The thermometers were of a type sold by Eimer & Amend, Fisher Scientific Company (Model 32153) 12 in. length with one-degree calibration and a 0 to 120 degree Fahrenheit range. A ½ in. length of 5/16 in. O.D. rubber tube was sleeved over the thermometer bulb to create a lag and minimize the change which might occur when the thermometer was pulled from the ground.

The tubes were ¾ in. I.D. fibre (low thermal conductivity plastic tube equally satisfactory), assembled from sections, threaded, pipe coupled and then painted with glyptol before burying. It was felt that the fibre had minimum heat conduction and that the column of air was too small to distort the readings. A tapered cork was attached to the upper end of the string and left forced into the top of the tube between readings. A teaspoon of sand was poured into the bottom of the tube so that the tip of the bulb extending ⅛ in. below the rubber sleeve would be immersed in the sand and thereby insure good contact with the ground. Caution was taken to locate the tubes away from the influences of water mains, sewers or septic tanks.

Two methods for burying tubes were

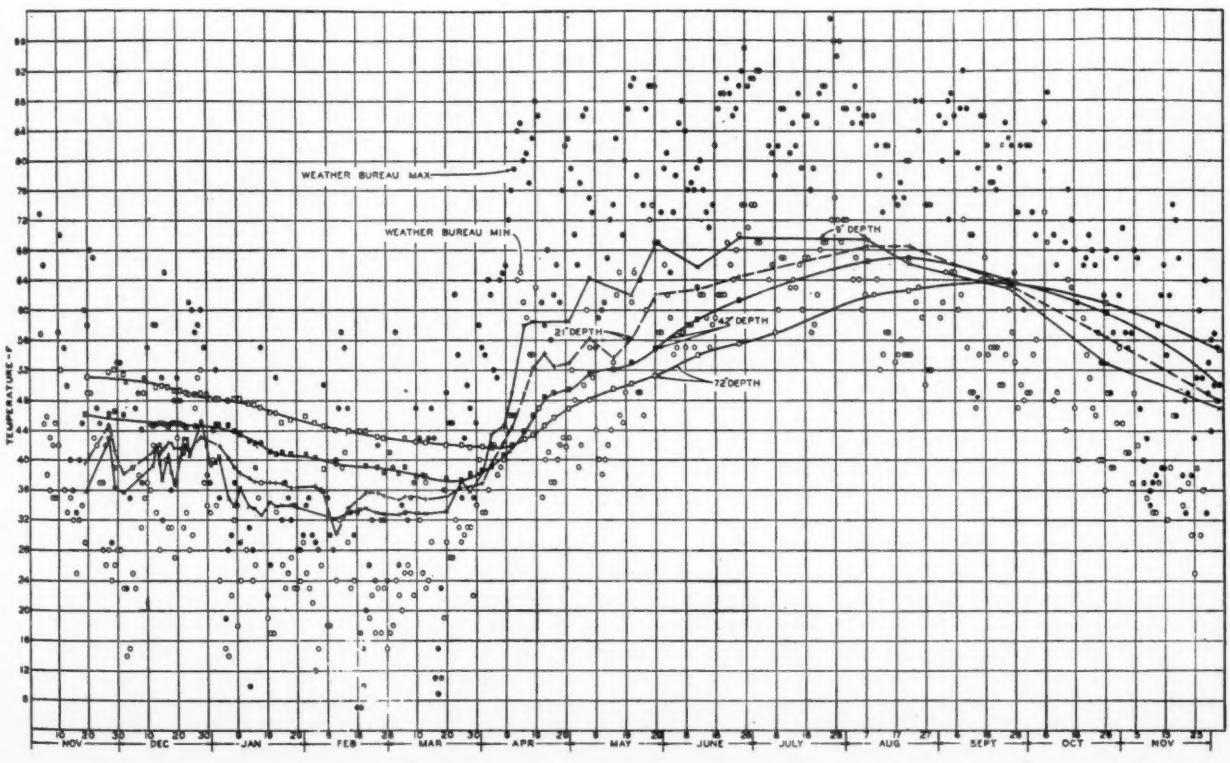


Fig. 1—Graph of Ground Temperatures at Various Depths in Relation to Minimum and Maximum Air Temperature at Pittsburgh, Pa.

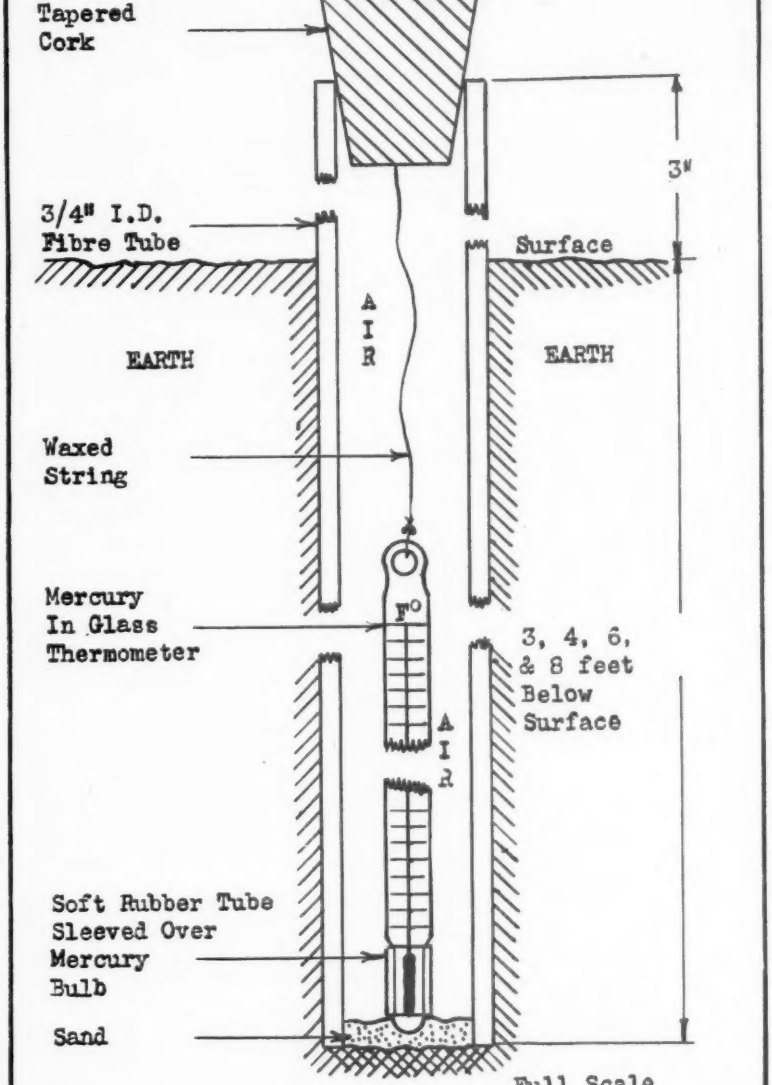


Fig. 2—Sketch Showing Method used by Connecticut Light and Power Co. for Taking Ground Temperature Measurements.

devised and found to be equally satisfactory. In one case four 1½ in. holes were drilled with a sampling auger; and then back-filled around the ¾ in. tubes, using a ½ in. x 10 ft. rod as a tamp. In the other case, a 36 in. x 8 ft. pole hole was dug and the tubes spaced equidistant around the perimeter before back-filling. Conventional tamping methods were used but care was taken that no large lumps be allowed to lodge around the tubes, as the resulting voids might distort the readings.

A standard method of reading the thermometers was adopted to insure uniform results. As the thermometers were pulled from the ground, a thumb nail is placed on the mercury location and then the graduated stem is read.

Weekly readings were found frequent enough, since the rate of change in ground temperature is so slow. The depths of measurement were arbitrary; but since there was reason to believe that measurable annual changes in temperature might be experienced down to, but not below, 10 ft., in the New England area, it was decided to limit the points of measurement to 3, 4, 6 and 8 feet below ground level.

Suggested Procedure

Based on the experience in Connecticut and elsewhere, Joint AEIC-EEI Heat Pump Committee suggests the following practice as suitable for preliminary ground-temperature survey. (See Fig. 2.)

1. Measurements at 3 ft and 8 ft depth only, taken weekly.
2. Thermometers mercury-in-glass 12-in. long, range 0 to 120 F graduated to 1 F; readings to be recorded to nearest whole degree.
3. Tubes ¾ in. I.D., of low thermal-conductivity fiber or plastic.
4. Soil sampling auger preferred to pole hole method of installation; tubes spaced approximately 2 ft apart.
5. Backfill compacted by tamping without water addition; excavated soil covered to prevent moisture loss during interval between digging and backfilling.
6. Presence of water in fiber tube to be ascertained, and temperature readings discarded if water standing more than 6 in. in bottom of hole.

Industrial Relations Committee Personnel Conference April 21-23

The Industrial Relations Committee of the EEI has announced a three-day conference on personnel problems, on April 21-23, at the Coronado Hotel in St. Louis, Missouri.

The program for this meeting has been developed on the conference plan of discussion, with those present divided into several small groups, each group with a nationally known leader.

Subjects to be covered in the group discussions over the three-day period will include Employee Surveys, Training Programs, Job Evaluation, Wage Plans, Morale Building, etc. Attendance at the meeting is limited to not more than two representatives of a single company, with total registration limited to 100. The meeting is designed especially for Personnel Directors and their first-line assistants. Registrations may be made with E. S. Evans, Edison Electric Institute.

Recent Developments in Dry Type Transformers for Submersible Service

By W. W. Satterlee
Division Engineer, Westinghouse Electric Corporation

A paper presented at the Transmission and Distribution Committee Meeting, EEI, held in St. Louis, Missouri, on February 10, 1948

MANY transformers of all kinds are taxed to capacity and at times they are subjected to dangerous overloads. In some instances, they receive very little attention and are not properly maintained. These conditions make all features which promote safety and continuity of operation with minimum maintenance doubly important.

Although the use of inert gas, relief devices, and protective relaying reduces the probability of explosion, no liquid-immersed transformer is explosion-proof in the true sense of the word; and oil-immersed transformers are not fireproof. These factors reduce the safety of operation of liquid-immersed transformers, particularly if they are subjected to frequent overloads.

Thus, dry type transformers have become a very important and a useful means for the safe and economical distribution of electric energy.

History of Use of Dry Type Transformers

A dry type transformer is a transformer devoid of all liquids, and one whose core and coils and associated parts are cooled by the natural or forced circulation of air. The first transformer ever built was of dry type design. Since then, hundreds of thousands of small dry type units have been put into service. For many years, relatively large transformers of the air-blast type served railway and other substation requirements. But, all of these transformers were constructed with cellulose or Class A insulating materials, and the temperature rise of their windings was limited to an average of 55 C degrees.

About 12 years ago, realizing the need of a transformer which would be essentially fireproof and free from explosion, Westinghouse introduced a new kind of dry type transformer to the trade. These transformers are built in large ratings; and, for the most part, they are insulated with inorganic materials such as glass, porcelain, and mica.

In order that I may present my subject clearly, I shall briefly describe the design of these transformers. They are of core form construction. Fiber glass is used to cover winding conductors. Spacers which form air ducts in the windings and give mechanical support to them, are made of glass or porcelain. All low and high voltage leads are supported on porcelain. Barriers, made from an organic material, are used to separate the windings from the core and from each other, but these barriers operate at temperatures appreciably lower than those of the windings since they do not touch them. Core and coil assemblies are treated with an organic thermoset varnish. This treatment protects metal parts against rusting, locks hardware in place, adds to the mechanical rigidity of the structure and to its ability to withstand shipping stresses, and gives a measure of moisture resistance especially during periods of time when the transformers are not in service.

Today thousands of these type ASL transformers, nearly two million kva, are giving satisfactory service under almost all kinds of applications. They have been built in single, self-cooled ratings as large as 3750 kva and in forced air-cooled ratings of 10,000 kva. These transformers use ventilated cases, and they are normally designed for indoor installation.

Use in Submersible Design

As a result of the excellent operating record of this line of transformers and at the suggestion of some operating engineers, we decided that is was possible to design a core and coil assembly which could be used, tightly sealed in a tank so that we would have a dry type transformer entirely suitable for submersible or outdoor installation.

Consequently, and with the cooperation of the Consolidated Edison Company of New York, a 500-kva, 3-phase, 13-kv network transformer, suitable for submersible service, was designed and built. Following the satisfactory completion of all required tests, this unit was put into service in a street-vault in New York on Nov. 18, 1943. It has operated continuously and satisfactorily for more than four years. Since then, two 500 kva, 11.8 kv submersible network transformers have been built for the Rochester Gas & Electric Corporation. These transformers were recently installed in sidewalk vaults in Rochester, New York, In addition, three 300-kva, 4-kv, submersible transformers will soon be completed and put into service in downtown Pittsburgh on the network system of the Duquesne Light Company.

Core and Coil Construction

The core and coil assemblies of these submersible dry type transformers are of core form construction; and in appearance, they resemble closely the design used in the ventilated dry type transformers. However, to meet operating conditions, the submersible design is constructed entirely of inorganic insulating materials and with bonds of semi-inorganic materials such as silicones or melamines.

Fig. 1 shows the core and coil assembly of a 500-kva unit. Winding conductors are covered with glass, bonded with a silicone varnish. Porcelain or glass spacers form air ducts in the windings. Glass tubes center the low voltage windings over the core. Clear cylindrical ducts of air separate the high voltage windings from the low voltage windings. Core and coil assemblies are treated although sparingly with a silicone varnish, since the principal purpose of this treatment is to add mechanical rigidity to the assemblies during shipment of the transformers. Plate glass is used to provide insulation between phases. A complete 500-kva submersible transformer is shown in Fig. 2. This unit includes a three-position, high-voltage switch mounted on one end of the tank, and

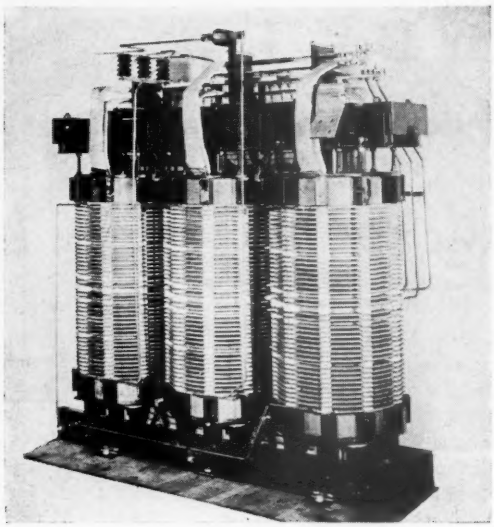
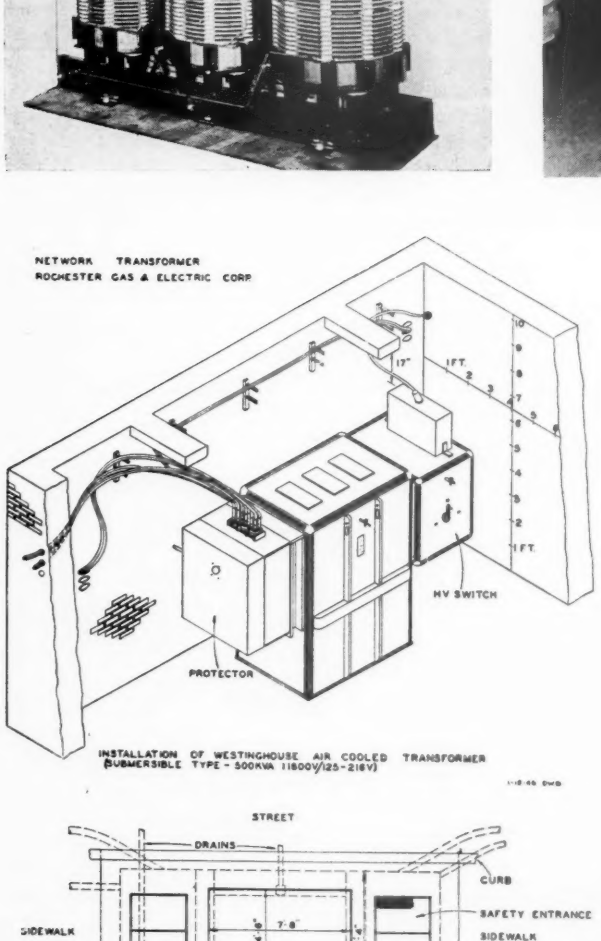


Fig. 1—(Above, left)—Core and Coil Assembly for a 500-Kva, Submersible, Dry-Type Transformer

Fig. 2—(Above, right) A Complete Unit of the Submersible, Dry-Type Transformer — 500 Kva, 3-Phase, 11,800 - 216 Volts



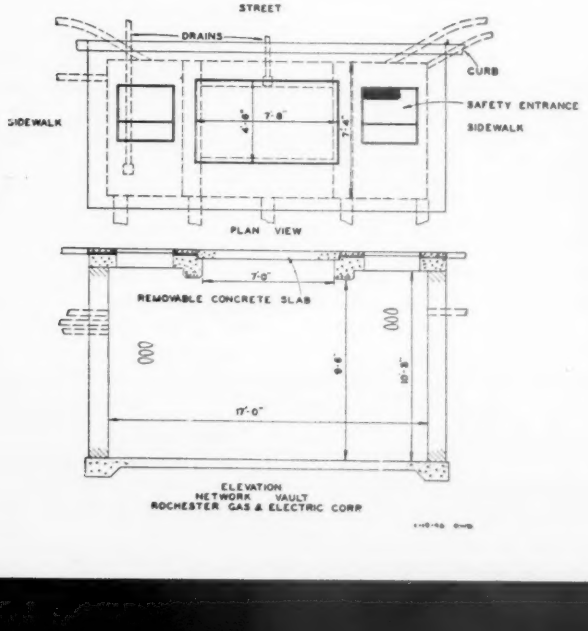


Fig. 3—(Lower, left) Diagram of the Installation of a Submersible, Dry-Type Transformer in a Sidewalk Vault —Rochester Gas & Electric Corp.

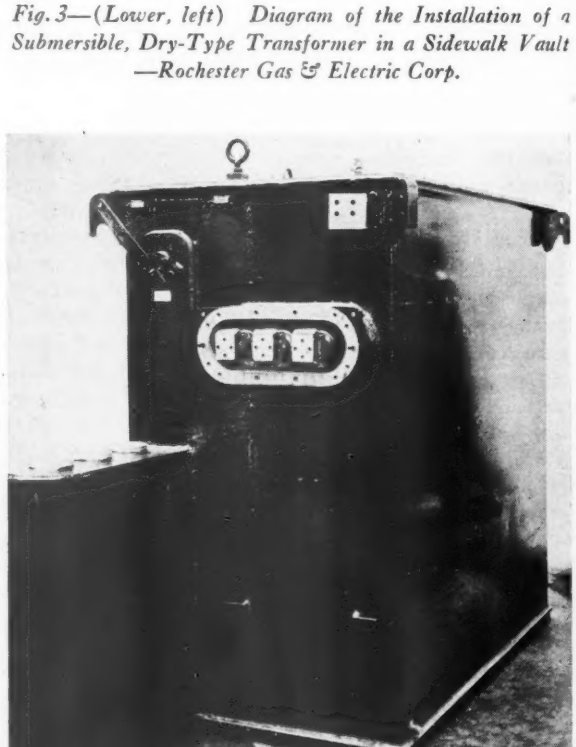


Fig. 4—The First Submersible, Dry-Type Transformer in Operation Continuously Since November 1943—500 Kva, 3-Phase, 13,750 - 216 Volts

provision is made on the other end of the tank for mounting a low-voltage network protector. The arrangement of the sidewalk vault with this unit installed is pictured in Fig. 3.

An external view of the first 500-kva, 13-kv submersible dry type network transformer which was installed in 1943 is shown in Fig. 4. The all-welded construction may be noted. This unit is equipped with an internal, two-position, high-voltage grounding switch. The high voltage, single conductor cables enter the transformer through a terminal chamber which is mounted on one end of the tank, near the bottom. Provision is also made for mounting a low-voltage network protector on the same end of the tank.

Actually, there are but few differences in the design and construction of dry type submersible transformers other than in some of their details and in their general arrangements which are necessary to meet the varying conditions of design, installation, and operation. All of them are designed for operation with their tanks filled with nitrogen at atmospheric pressure.

Some of the principal advantages of these transformers are: dry type design means that they are devoid of all liquids; and since their construction excludes nearly all organic materials, fire and explosion hazards are eliminated. They are built in tightly sealed tanks, and they may be designed with all-welded construction so that no gaskets are necessary. These features, combined with operation in nitrogen, practically eliminate the possibilities of secondary or vault explosions. Under no normal operating condition can a combustible gaseous mixture be formed, and it is highly improbable that sufficient pressure could develop under any fault condition to rupture the tank.

Installation of these transformers is easily and quickly accomplished since the need of fireproof vaults is unnecessary. Because all liquids are eliminated and as most valves, fittings, and gaskets are unnecessary, maintenance time and expense are reduced to a minimum.

The design of sealed-tank, dry-type transformers has not been confined to network application only. A 150-kva, 2400-v sealed-tank dry type transformer designed for portable service in coal mines, has been in service in a mine in West Virginia for more than two years. This transformer is equipped with disconnecting low- and high-voltage cables which add to its portability. The low-voltage cables connect to explosion-proof air breakers. We are building a number of these units for this type of service. Their general design follows that of the submersible dry type network transformers except for the very low height and other features necessary to meet mine operating requirements.

Insofar as possible, these dry type submersible transformers are designed to be used in place of the equivalent liquid-immersed units. Some data on the test results of the network units may be of interest. Table I gives a comparison of their total losses, temperatures, and sound levels. It may be noted that the original unit had higher loss, higher temperature and a higher sound level than the transformers which were built in 1947. This may be attributed to differences in ratings and detail requirements, to improvements in design and a desire to make this type of transformer competitive with other types of submersible transformers. In addition to the usual tests, these transformers were operated at 125 per cent of rated load until their windings reached constant temperatures. Samples of gas were then taken from within their tanks and analyzed for combustible gases. None were found. The pressures which developed within the tanks under this loading did not exceed four pounds.

A comparison of weights and dimensions of the dry type network units with the same kva and voltage ratings of similar liquid-immersed transformers may be seen in Table II. This comparison is not necessarily exact, since the mechanical arrangements of the two types of transformers may vary because of design and operating requirements.

TABLE I—LOSSES, TEMPERATURES AND SOUND LEVELS OF SUBMERSIBLE, DRY-TYPE NETWORK TRANSFORMERS

	500 KVA, 3 Ph 13750/216 Volts In Service 1943	500 KVA, 3 Ph 11800/216 Volts In Service 1947	300 KVA, 3 Ph 4160/208 Volts In Service 1948
Total Loss	6550 Watts	5350 Watts	4000 Watts
Low Voltage Winding Average Rise by Resistance	102° C	82° C	110° C
High Voltage Winding Average Rise by Resistance	112° C	93° C	111° C
Test Ambient	26° C	34° C	18° C
Temperature of Tank Wall Outside at Top	52° C	58° C	67° C
Temperature of Air at Top Inside Tank	------	70° C	114° C
Low Voltage Winding Hottest Spot Temperature	147° C	131° C	151° C
Estimated Hottest-Spot Temperature High Voltage Winding	159° C	145° C	152° C
Sound Level, DB_{40}	76	62	58

TABLE II—COMPARISON OF WEIGHTS AND DIMENSIONS OF DRY-TYPE VS. LIQUID IMMERSED NETWORK TRANSFORMERS

	500 KVA - 3 PHASE				300 KVA - 3 PHASE 4160/208 VOLTS	
	13750/216 VOLTS		11800/208 VOLTS			
	DRY TYPE	INERTEEN	DRY TYPE	INERTEEN	DRY TYPE	INERTEEN
FLOOR SPACE - INCHES						
Transformer	45 x 81	39 x 70	39 x 80	41 x 63	30 x 83	34 x 71
Complete Network Unit	45 x 103	39 x 92	46 x 124	41 x 95		
HEIGHT - INCHES						
Transformer	71	68	83	66	67	71
WEIGHTS - POUNDS						
Core & Coils	6600	4350	7100	3950	4400	3400
Case & Fittings	3200	3300	3000	3600	2400	2500
Inerteen	----	2750	----	2750	----	2600
TOTAL	9800	10400	10100	10300	6800	8500

There is a Class H insulating material used in the construction of these dry type transformers, but the fact is that all of the other materials in them are Class C, inorganic. The hottest-spot temperatures of their windings are less than the proposed standard for Class H materials. It may be noticed that the highest temperature of the tank of these dry type transformers, when carrying rated load, is unlikely to exceed the hottest tank temperature of the average liquid-immersed transformer.

Having mentioned some of the advantages of sealed-tank, dry type transformers, it is only right to state that, at present, they have certain disadvantages when compared with liquid-immersed transformers. For instance, dry type sealed-tank transformers are usually larger. They are more expensive.

In the designs which we have made, the principal reasons for this are: core and coil assemblies are larger since the major insulation is air and greater electrical clearances are necessary. Thus, the transformers may be larger and in some applications, this will complicate or perhaps prohibit their use in place of liquid-immersed transformers.

The use of inorganic insulating materials presents some difficult problems in the design and manufacture of these transformers. Also, silicone-bonded-glass and similar products are relatively new and they are costly. In addition, it is difficult to fabricate them.

These things, coupled with the need of rather low sound levels for most network applications, make dry type sealed-tank transformers appreciably more expensive than liquid-immersed transformers.

In conclusion, may I point out that these submersible dry type transformers are of comparatively simple design. They are free of most fittings, gaskets and gadgets which always require attention. We believe that operation in a tank filled with a noncombustible gas at atmospheric pressure should prove most satisfactory and economical. Better cooling might be obtained by the use of additional tank surface or by the use of fans to circulate the gas internally; but such things tend to complicate the design, installation, and operation of the transformers. They also increase the size, cost, and maintenance of the transformers.

A number of these transformers are in service and others will be placed in service this year. This type of transformer is available to the trade, even though its design and installation present some problems to the manufacturer and to the purchaser. Continued development and greater use of these transformers should help to improve these conditions.

Another phase of this subject should be mentioned. Considerable work has been done by a number of investigators to determine the possibilities of using certain gases under pressure in sealed containers to obtain an increase in dielectric strength and better cooling. Mr. Camilli and Mr. Chapman of the General Electric Company recently presented an interesting AIEE paper entitled "Gaseous Insulation for High Voltage Apparatus." This and similar data by other authors show the possible use of a number of gases. Experimental work to date indicates that sulfur hexafluoride has the most desirable characteristics. This gas is reasonably stable, and it is noninflammable. Data have been published which show that dielectric strengths comparable to mineral oil might be obtained with the use of sulfur hexafluoride at pressures of two to four atmospheres. If the practical use of such a gas proves to be satisfactory, it may become possible to design and build sealed-tank, dry type transformers with weights and dimensions quite comparable to those of liquid-immersed transformers.

However, one should keep in mind that transformers operating under pressures of two or more atmospheres will require tanks of special design and with considerable mechanical strength and that the successful operation of such transformers will be entirely dependent upon maintaining the gas under the required pressure continuously. This cannot be accomplished easily and it may prove more satisfactory and economical over-all to make the transformers somewhat larger and to seal them at atmospheric pressure.

In Passing

By Dean Sims

Editor, Electrified Farming

An Editorial reprinted by permission in its entirety from the December, 1947 issue of Electrified Farming. *The magazine is published monthly by the United Light and Railways Service Company for its rural customers in Iowa, Ill., Kansas and Missouri.*

THE characteristic sad moaning of the train whistle woke us early in the morning recently, as we slept during a railroad trip through the rural Midwest. Our pullman must have been attached close to the engine, because our first impression was that the whistle was under our pillow.

Wide awake but not particularly anxious to clamber out of the warm bed, we raised the window shade and looked out over the still-dark countryside. A few lights twinkled through farmhouse windows here and there, like so many square-bottomed fireflies. It wasn't five o'clock yet and the backbone of the nation—possibly the world—was beginning to come to life for another day.

About this time we began getting glad that the whistle had awakened us. These observations were interesting, and we began thinking of passing them on to you.

When our pullman rolled by a farm house, which had electric lights illuminating the area from the back of the house to the barn, we recalled that it was only a few years ago that we had observed farmers with lanterns moving along the same house-to-barn route, about that same time of morning. Just for fun, we watched to see if we could see a farmer going out to start his chores, carrying the old oil-burning lantern. We must have traveled for 20 miles without sighting a one. Not many years ago, we'll bet we could have counted 15 along the same route.

Instead of farmers with lanterns, we saw houses, yards, barnlots and barns all lighted with electric lights. Yes, the countryside had undergone a change since the last time we had taken time to observe it from an early-morning pullman car.

Like the horse and buggy, hitching-posts and newspapers without pictures, the farmer with the lantern is giving way to progress.

To the casual observer, the passing brings up a feeling of nostalgia. To the farmers who have stumbled through their morning chores by lanternlight for years on years, the passing brings up a feeling of gratitude that progress is making his life a better life.

Industrial Management Institutes Sponsored by University of Wisconsin

By J. D. Howard

General Sales Manager, Wisconsin Power and Light Company

THE University of Wisconsin Extension Division and School of Commerce are rendering to the business organizations of the state a worthwhile educational program through Industrial Management Institutes.

This type of program was developed during the war when the expansion in business and industry made it necessary for management to promote many workers into supervisory positions. Because of their lack of supervisory experience, these workers had to be trained for new duties and responsibilities.

Evening Courses

To meet the need for specialized supervisory training, a series of evening courses was set up at the University under the Engineering, Science, and Management War Training Program of the United States Office of Education.

Because of the popularity of these evening classes, a full time program of Industrial Supervisory Institutes was offered in the fall of 1944.

Under the direction of Doctor Russell L. Moberly this program has been expanded during the past three years so that 250 business and industrial organizations in 70 communities have participated in the Institutes. Over 1500 members of management personnel have attended one or more of the courses offered.

Institute Objectives

The objectives of the institutes are:

1. To train executive, staff and supervisory management personnel to recognize more clearly and carry out more effectively their duties as an integral part of management.

2. To keep enrollees informed on the newest developments in management techniques, both in practice and research.

3. To develop in management personnel the best qualities of leadership and the most effective techniques of handling people.

4. To promote cooperation and exchange of information between companies resulting in mutual benefit through more efficient management.

5. To develop a better understanding of our free enterprise system and its needs.

6. To train management people to become better conference leaders by acting as discussion leaders for the various Institutes.

Group Discussion Sessions

Each Institute session consists of a combined presentation by discussion leader, and an informal discussion among the members of the group, guided by the discussion leader. In addition to Dr. Moberly and his staff, discussion leaders are chosen from the University, from other educational and governmental institutions, and from business and industrial firms throughout Wisconsin and the nation. Leaders are selected for both their proved technical abilities in particular fields and for their ability as effective leaders for the mature management personnel who attend the Institute programs.

These Institutes delve into management techniques and functions, and subjects in human relations. Included also are Executive Management Seminars on pertinent industrial problems, and as well, Special Institutes for technical people.

During the week of October 13-17, an Institute on Sales Administration and Operation was held. The major subjects discussed were:

1. Some characteristics of a sound sales organization,

2. Coordination of sales, engineering, and production,

3. Coordination of sales advertising and credit control,

4. Sales personnel problems,

5. Selecting and training the sales force,

6. Problems of field organization,

7. Methods of compensation of salesmen,

8. The Sales Conference,

9. Selling for export.

Human Relations Institute

Another example is the Institute on Human Relations for Staff Management. Some of the subjects discussed are:

1. The functions of staff management in the industrial organization,

2. Understanding individual employees,

3. Employee job relations,

4. Training in industry,

5. Staff management's role in the training of employees,

6. Human Relations in Industry.

These Industrial Management Institutes are financially self-supporting. Enrollment fees are paid to cover the cost of attendance of personnel including the cost incurred in the administration and presentation of the Institute.

Fayette H. Elwell, Dean of the School of Commerce at the University, has been largely responsible for encouraging this type of service for business and industry in the state.

Through many activities, of which these Industrial Management Institutes are one, the University of Wisconsin has recognized the opportunity of serving all the citizenry of the state, and is making a major contribution to the economic progress of Wisconsin.

Benefit to Utility Companies

Considerable benefit has come to several utility companies in Wisconsin through their supervisors who have attended a special type of conference at the University. Not only has the educational value been high, but these conferences have also served as a check-up on company training programs. Where utility men have served as conference leaders, they have built prestige for the company among customers.

New Uses and Applications of Electric Service

Release No. 1

COMPILED BY THE GENERAL POWER AND HEATING COMMITTEE, INDUSTRIAL POWER AND HEATING SECTION, EEI—W. P. LYMAN, *Chairman*, APPLICATIONS AND EQUIPMENT SUBCOMMITTEE

January, 1948

● Castaloy Corporation, Detroit, Mich., has brought on the market a VacuTherm Generator said to be particularly applicable in the heating of plastics. The unit employs Dowtherm E as the transfer medium which is sealed in a heavy welded chamber with insulated jacket. Temperatures of from 70° to 550° F are maintained within plus or minus 5°. Three sizes are offered—16, 22 and 33 kw. A temperature rise to 400° F in 15 minutes at which temperature the pressure is only 15 psi. Connection to the job can be made with flexible tubes or pipes.

● A large blanket manufacturer installed 126 kw of supplemental infrared heating in series with steam rolls for drying heavy blanket goods.

● The Goodyear Tire & Rubber Company has developed by proper compounding a rubber-like material called Pliotherm. Instead of being an insulator, as is ordinary rubber, it is capable of conducting electricity either for transformation into thermal energy, or for the dissipation of electrical charges. It can be made in sheets up to ⅛ in. and as a heat source is laminated between sheets of insulating material. In this application thermostat control should be used. Continuous operation above 150° F is not recommended. Its tensile strength is 1500 to 2000 psi, elongation properties 200 to 350 per cent and shore hardness "A" 70-85. Best colors are black, dark brown, red or green when used between insulating outside rubber plies.

1 watt per sq ft = 3.4130 Btu's per sq ft per hour. Wide application such as heated gaskets where there is a tendency to freeze when moisture is present, for De-Icer Treads on steps and stairways subject to freezing over, thawing frozen pipes, domestic heating pads, heated rubber rolls, in the plastic industry, etc.

● A lawn mower manufacturing plant—reels are assembled completely and all spiral blades are hardened progressively at the same time by the use of high frequency induction heating.

● One of the new GE packaged airport lighting systems just installed at Clarksburg, W. Va. The package kit, a system for small airports, consists of runway lights with special lenses to be mounted 18-20 in. above the ground level, constant current regulator which controls brightness of the lights, also permits lighting of three runways, one runway at a time, and controls lighting of other equipment on the airport. Includes green threshold lights at ends of runways at 200 ft intervals and enough runway lighting capacity for 7000 ft or less of runways.

● A synthetic rubber processing plant cleans extruding dies by placing them in a standard plating tank, with proper solution and reverse polarity and cleans by passing direct current through them. Standard copper oxide rectifier used.

● Manufacturer of heat exchangers—dehydrates large exchangers used for air conditioning and for other purposes by inserting the shells in the secondary circuit of high ampere, low voltage transformers. Results in moisture free container ready for use.

● A Birmingham laundry increased the output of its finished work by 50 per cent by installing 12 kw of infrared on a flat work ironer. This is a 6-roll horizontal Smith drum flat work ironer. Three rows of 16 lamps per row were installed between the last three rolls. This kept the owner from buying a new ironer since this operation was the bottleneck in his plant.

● Chromolax has come out with its answer to infrared heat. The individual units 2, 3 or 4 ft in length have cast aluminum alloy reflectors with a tongue on one side and a groove on the other. Thus, they can be assembled in multiple banks as required much the same as multi-tube fluorescent lighting fixture. Cost approximately $10.00 per ft plus the thermostatic control. No lamp renewals or explosions from broken lamps. Can maintain temperature of element at any level and thus below combustion temperature of inflammable gases.

● Progressive Welder Company has come out with a new 3 phase balanced power stored energy welding unit. Low power demand, no transient surges, high power factor, no special transformers. Made for flash welding, gun welding. Spot and projection and multiple spot welding.

● A coal company is using an automatic welding head to build up worn locomotive wheels. The head utilizes coils of welding rod material fed off of a reel automatically as the wheel is turned in the machine. The device saves labor over the old method of hand welding, does a smooth job and can be done without removing the wheel from the axle. Less cleaning and turning of the new wheel is required. The device uses d-c maximum of 700 amperes or the full output of 2-30 hp M-G welders.

● A coal mine in Virginia is cleaning coal electrostatically. Another, in trying to overcome the objection to coal dust in its delivered product, is treating the coal with oil maintained at the desired temperature by submersion electric units.

● The Textile Technological Institute at Charlottesville, Va., has started an extensive research program on textile drying operations. The Power Salesmen in the Southeast, where 78 per cent of the active cotton spindles are located, have already started the survey which will picture the extent of this market. In addition to these surveys the Institute has sent its technician into several plants to make detailed examinations. Even with a most preliminary answer, it appears that for bean and cheese drying, dielectric heat is a natural. For raw stock drying it appears that infrared will prove to be the answer. For cotton slashers one Fostoria Infrared Slasher is now under detailed study. Breakage tests, penetration of sizing analysis and other extensive research has just started. The answer is not yet known. Rayon slashers are being analyzed but to date we know of no form of electric heat that has been applied.

Final Progress Report

Fundamental Investigation of Graphitization of Piping

CONDUCTED BY JOINT EEI-AEIC SUBCOMMITTEE ON GRAPHITIZATION OF PIPING
L. E. HANKISON, T. E. PURCELL, ALEX D. BAILEY, *Chairman*

January, 1948

THIS constitutes the seventh and concluding report on the "Fundamental Investigation of Graphitization of Piping." Six previous progress reports have been distributed in mimeograph form to those interested, and published in the October 1943, April 1944, October 1944, July 1945, February 1946, and May 1947 issues of the EDISON ELECTRIC INSTITUTE BULLETIN.

The sixth report summarized the work at the Battelle Memorial Institute, and indicated certain specific items which seemed to warrant further investigation in a limited extension of the research project at Battelle.

The present report is primarily concerned with the results obtained at Battelle since March 1947, involving: (1) continued tests at 1,125 F of previously tested materials which had indicated good resistance to graphitization; (2) further effort to evaluate the influence of elastic stress and plastic deformation on graphite formation.

Continued Graphitization Tests

A summary of the results of further graphitization tests at Battelle on a selected group of graphitization-resistant steels is as follows; all of the samples were bead welded or from a welded joint:

Plain-carbon, low-aluminum — No graphite after 8,500 hr at 1125 F either as welded, or as-welded and post-weld stress relieved at 1425 F.

Carbon-molybdenum, low-aluminum, Steel G-18—Trace of graphite, 15,200 hr at 1125 F. No measurable increase over previous test at 11,700 hr.

Carbon-molybdenum, low-aluminum, Steel G-19—Appreciable random graphite after 8,500 hr at 1125 F. No graphite found on previous test of 5,000 hr at 1125 F.

Carbon-molybdenum, silicon deoxidized—No graphite after 15,200 hr at 1125 F.

Carbon-molybdenum, titanium deoxidized—No graphite, 1,700 hr at 1025 F, plus 8,500 hr. at 1125 F.

Chromium-molybdenum — Both high and low-aluminum deoxidized, ½ to 2½ per cent chromium, ½ to 1 per cent molybdenum. No graphite, 7,500 to 8,500 hr at 1125 F.

Molybdenum-Vanadium—No graphite, 7,500 hr at 1125 F.

The additional data summarized herein as well as that of other investigators[1, 2] confirm the previously expressed conclusions that chromium-molybdenum steel containing more than ½ per cent chromium possess a high order of resistance to graphite formation for service temperatures of 1000 F, or better. Apparently aluminum deoxidation may be used in manufacturing the steel if it contains more than ½ per cent chromium without impairing its graphitization resistance. The data further suggests that other compositions and types of low-alloy ferritic steel may also possess good resistance to graphite formation. The cast molybdenum-vanadium steel containing 1.15 per cent molybdenum and 0.23 per cent vanadium showed no graphite. Another laboratory,[3] however, found graphite in an induction-melted, forged 1½ per cent molybdenum—0.16 per cent vanadium steel after 10,000 hr at 1050 F. No aluminum was used in deoxidizing this steel.

Still another [2] laboratory found graphite in aluminum-deoxidized cast molybdenum-vanadium steels containing about ½ per cent molybdenum and about 0.15 per cent vanadium after 20,000 hr at 1025 F. Apparently the addition of vanadium alone to the extent of about 0.15 per cent to an aluminum-deoxidized steel is in itself not sufficient to insure carbide stability, whereas a sample containing 0.23 per cent vanadium, and made without aluminum deoxidation, is resistant to graphitization.

The exact effect of vanadium, manganese, and silicon on graphitization resistance of steels is not too well understood. Vanadium seems to be an inhibitor of graphite formation under certain conditions, but the data are insufficient to rate its effectiveness. Perhaps some minimum amount in relation to the carbon content must be present. There is some evidence that manganese may be an important factor in cast steels as both the molybdenum-vanadium, and the plain carbon steel which possessed good resistance to graphitization contained well over 1 per cent manganese.

Finally, the role of silicon is much in doubt. The virtue of silicon killing as compared to aluminum deoxidation may result from the difference in effect that these elements exert as deoxidizers. Several investigators have reported that low-carbon rimmed (partially deoxidized) steel possesses remarkable resistance to graphitization at 900 F. Neither spectrographic nor chemical analyses offered any clue as to why one low-aluminum deoxidized carbon-molybdenum steel (G-18) showed only a trace of graphite after 15,200 hr at 1125 F, whereas the other (G-19) showed appreciable random graphitization after 8,500 hr at the same temperature. Further investigation of the effect of deoxidizers might be worth while.

While it is possible that a molybdenum-vanadium combination, or a titanium or manganese steel may readily meet service requirements, considerable

---

[1] "A Study of the Properties of 0.5 per cent Chromium—0.5 per cent Molybdenum Pipe Steel," by R. C. Fitzgerald, A. B. Wilder, G. V. Smith, and A. E. White. Presented at the ASME Annual Meeting, Dec. 5, 1947.

[2] "The Structural Stability of Several Cast Low-Alloy Steels at Elevated Temperatures," by V. T. Malcolm and S. Low. Presented at the ASME Annual Meeting, December 5, 1947.

[3] "Graphitization of Steel at Elevated Temperatures," by A. B. Wilder and J. D. Tyson, ASM Preprint No. 14, 1947.

further investigation would seem necessary to firmly establish such compositions. Chromium-molybdenum steels, on the other hand, are without question strongly resistant to graphite formation.

The data secured during the last test period seem to lend support to the theory that there may be an incubation period in the graphitization phenomenon. This would assume that all the common ferritic carbides are unstable, but for an idealized steel, the incubation period is so long as to indicate permanent stability, or at least stability for the useful life of the material. Present experience has been insufficient to determine whether or not the very resistant steels have incubation periods. If the material is stable over its useful life, whether or not it has an incubation period probably has little practical significance.

Specimens Stressed In Tension

As stated in the Sixth Progress Report, previous efforts at Battelle to evaluate the influence of elastic stress and plastic deformation were not satisfactory, although cases were reported in the field where graphitization seemed clearly influenced by a deformation phenomenon. Further tests were undertaken in which deformation was obtained by stressing in tension using two types of tensile specimens, and three types of steel. Results again were negative, however, as no correlation was obtained in these tests between graphite formation and plastic deformation.

Conclusion

The original and both supplementary programs at Battelle Memorial Institute have been completed. It is now deemed possible, with the aid of these findings and those of independent investigators made available through ASME papers,[4] and otherwise, to give reasonably definite answers to a number of the more important questions regarding graphite formation, many of which have been fully covered in previous progress reports.

Much remains to be done before a complete answer can be made available as to the mechanism of graphitization and the specific influence of the many contributing factors affecting graphite formation. As stated in the previous progress report, however, the problem now seems well enough understood, and the work has advanced sufficiently far to warrant leaving further research work on present and new materials to the research laboratories of steel mills, valve manufacturers, piping fabricators, and others.

It seems prudent that operating companies continue to sample existing welded joints in susceptible materials as frequently as is deemed necessary to determine the presence and progress of graphite formation.

In concluding its work, the Committee wishes to acknowledge with thanks the contributions of all those who assisted in this program.

[4] One or more sessions on graphitization were held during the Annual Meetings of the ASME in each of the years 1943, 1944, 1945, 1946, and 1947. Reprints of the 1943, 1944, 1945, and 1946 groups of papers have been distributed in bulletin form, as well as printed in the Transactions of the Society.

Kansas City P&L Engineers Provide Books for War-Devastated Areas

As part of a nationwide project to re-stock reference libraries in war-devastated areas around the world, Kansas City Power & Light Company engineers, at the suggestion of Sam H. Pollock, assistant supervisor of the Overhead department, have assembled approximately 3,000 pounds of technical and engineering periodicals which have been shipped to the American Book Center, Inc., Library of Congress, Washington, D. C.

As a member of the American Institute of Electrical Engineers, Mr. Pollock received a leaflet announcing the project and soliciting engineering books, scientific and technical magazines, documents on municipal planning, public health, medicine and public welfare as well as encyclopedias, dictionaries, manuals and handbooks. A check with the Power & Light Company librarian proved that approximately 60 engineering periodicals are received at the company each month and that a five-year supply of these, or approximately 3400 magazines, are now on hand. Normally, these are sold for waste paper or donated to the Boy Scouts, but company officials readily agreed that these periodicals should be used in those war-devastated areas in which they are needed. The Kansas City Power & Light Company will pay all transportation charges.

Power & Light Company engineers agreed to donate their time to crating and shipping the publications which will be packed in Washington for reshipment to war areas. The project is being sponsored nationally by the Engineers' Joint Council. This group includes members of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers.

Sam Pollock (left) and Fred Gilpin, Kansas City P & L engineers who are crating and shipping a 4-year supply of technical books to restock libraries in war devastated areas.

Electric and Gas Utility Accountants Can't Afford to Miss It!

Joint Accounting Conference At St. Louis, Mo., April 12-14

THE variety and importance of subjects to be discussed at the April accounting conference is greater than ever before. Its location at St. Louis should bring a larger attendance from the southern and western areas and give accountants from utilities serving the eastern states an unusual opportunity to get at firsthand the experience and viewpoints current in areas other than their own. This interchange of ideas and mutual sharpening of wits is the prime objective of these conferences, which all who have attended them in the past can testify that they accomplish. No one person, no matter how experienced and well informed, and no one management, knows all the answers. You can always learn something from the other fellow.

The General Session Monday afternoon offers timely talks on topics with which all thoughtful utility accountants must today be deeply concerned. The fields dealt with are utility financing, employee relations, customer relations, and the big and vital subject of economics in our daily life.

The Program Committee has received wholehearted cooperation from the local utilities—Union Electric Company of Missouri and Laclede Gas Light Company. R. W. Otto, president of the latter, will give an address of welcome on Monday afternoon and has offered the services of all of his staff to any attendants at the conference who may wish to inspect his company's accounting and stores facilities. J. W. McAfee, president of the Union Electric Company of Missouri, also extends a cordial welcome to conference attendants, and offers every hospitality in his company's power. He regrets that he himself will be unable to address the conference, but recommends in the highest terms Mr. Alfred Fleishman, his company's counselor on public relations, who will speak on that subject at the General Session on Monday afternoon.

An important aspect of employee relations, the much discussed subject of employee rating plans, will be dealt with at the General Session by J. E. King, Consolidated Edison Company of New York, Inc.

Two other speakers at the General Session will come from outside the industries. Edward Hopkinson, Jr., of Drexel and Company, will speak on "Utility Financing in Tomorrow's Money Market." A man better qualified than Mr. Hopkinson for such a presentation could hardly have been obtained. A member of President Truman's Advisory Committee on the Conduct and Financing of United States Foreign Trade, a past president of the Investment Bankers' Association of America and, at various times including the present, a director and officer of important corporations, firms, and other organizations, he is exceptionally fitted to give us some useful suggestions for the successful completion of the huge financial program which the utilities have recently announced.

The last speaker on the General Session will be Dr. Martin R. Gainsbrugh, Chief Economist of the National Industrial Conference Board, who is an excellent speaker and thoroughly qualified to tell us some facts that we all need to have re-emphasized about the "Economics of Our Way of Living."

The sessions on Tuesday and Wednesday will be of more specialized interest.

Subjects of particular concern to the general accountants will be presented at one session on Tuesday morning, while at another session the customer activities group will hear discussions of topics in their own field. Tuesday afternoon there will be further division into still more specialized groups, and on Wednesday morning there will be 13 separate groups or committees, each dealing with its own program. An outline of the program as tentatively scheduled is given below.

This is still subject to some further change.

On Tuesday evening there will be a dinner meeting, for which the Program Committee has secured a speaker who not only is in the first rank as entertainer, but also has a stimulating message.

Something of an innovation at these conferences will be a luncheon session Tuesday of the General Accounting group, where opportunity will be given for informal discussion of the report of the Employee Relations Committee on rating plans for accounting for these employees.

The latest developments in accounting machines will be on exhibition by leading manufacturers of such equipment. The manufacturers who have thus far accepted the Program Committee's invitation to display their wares are:

Addressograph Multigraph Corporation
American Perforator Company
Bonnar-Vawter, Inc.
Burroughs Adding Machine Company
Clary Multiplyer Corporation
Cummins Business Machines Corporation
Diebold, Inc.
Friden Calculating Machine Co., Inc.
International Business Machines Corporation
National Cash Register Company
Peirce Wire Recorder Corporation
Pitney-Bowes, Inc.
Remington-Rand, Inc.
Standard Register Company
Underwood Corporation
Watson Manufacturing Company, Inc.—Rol-Dex Division

Attendants at the conference who arrive on Sunday afternoon are invited by President McAfee of the Union Electric Company of Missouri to attend a five o'clock broadcast in a series of dramatizations of incidents in the history of St. Louis, of which his company is the sponsor.

Those anticipating attendance should write promptly to the Housing Bureau, St. Louis, Mo., stating the accommodations desired and, of course, specifying that they are for the joint E.E.I.-A.G.A. accounting conference. Forms for requesting reservation may be obtained from E.E.I. or A.G.A. headquarters in case you have not already received them. We are assured of adequate room accommodations either in the Jefferson Hotel, where the meetings will be held, or in another hotel conveniently located.

All indications point to a highly successful conference.

TENTATIVE PROGRAM

MONDAY P. M., APRIL 12

General Session

Opening Remarks
H. B. HARDWICK, Chairman, E.E.I Accounting Division

Address of Welcome
R. W. OTTO, President, Laclede Gas Light Company

Utility Financing in Tomorrow's Money Market
EDWARD HOPKINSON, JR., Drexel and Company

Employees Performance Rating
J. E. KING, Co-chairman, Accounting Employee Relations Committee
The Importance of Customer Relations in the Future of the Industry
ALFRED FLEISHMAN, Public Relations Counselor
Economics of Our Way of Living
DR. MARTIN R. GAINSBRUGH, Chief Economist, National Industrial Conference Board

TUESDAY A. M., APRIL 13
General Accounting Activities Group

Micro-Filming—Pros and Cons in Its Relation to the Record Retention Problem
Consult Your Tax Man
EVERETT C. JOHNSON, Partner, Arthur Andersen & Co., Chicago, Illinois
The Troublesome Problem of Depreciation
Annual Reports as Public Relations Documents
WESTON SMITH, Vice President, *Financial World*
Do Your Property Records Reflect Your Physical Plant?
Accounting Development Service

Taxation Accounting Committees

Discussion of Current Tax Problems
Review of Recent Court Decisions
Vacation Pay Ruling GCM #25261
Depreciation of Right-of-way
Abnormalities, Section 711
Relief, Section 722
Responsibility of a company to its pensioners from a Tax Point of View
Electric Energy Tax on Current Consumed by Pasteurization Plants
Gas Storage Problems
Intangible Drilling Costs
Section 735—Excess Output

Materials and Supplies Committee (A. G. A. only)

Report of Purchasing Operations Sub-committee:—Requisitions, Purchase Orders, and Receiving Reports

Customer Activities Group

Review of Collection Practices From The Standpoint of Cost
Interim Report—Billing the Fuel Adjustment in Rates
Training Program and Manual for Meter Readers
Customer Information Manuals
Employee Performance Ratings for Accounting Office Personnel

12:30 P. M. General Activities Group Luncheon

Customer Activities Group

Customer Accounting Committee:—The Mechanics of Irregular Billing; Production Yardsticks for Customer Accounting Activities
Customers Accounting and Collecting Expenses in the Uniform System of Accounts
Credit and Collection Committee:—Residential Deposits — Are They Necessary?; "Pet" Collection Procedures.
Customer Relations Committee:—Appliance Service Policies. Experiences with Saturday Closing of Company Offices

TUESDAY P. M., APRIL 13
General Accounting Committee

Functional or Responsibility Accounting
Internal Auditing
Coordinating Internal and External Audits
H. S. KING, Manager, Price, Waterhouse & Co.
Machine Applications for General Accounting
Methods of Payroll Distribution

Depreciation Accounting Committee (E. E. I. only)

Current Trends in Depreciation Accounting Practices

Property Records Committees

Do Your Property Records Reflect Your Physical Plant?
Problem of Providing Construction Accounting Forces with Accounting Personnel of Major Projects
Property Records for General Equipment

Materials and Supplies Committee (A. G. A. only)

Report of Stores Operations and Equipment Sub-Committee:—Handling, Storage and Delivery of Major Appliances. Racks, Bins, and Storage Facilities.

WEDNESDAY A. M., APRIL 14
Materials and Supplies Committee (A. G. A. only)

Report of Purchasing and Stores Accounting Sub-Committee:—System of Codification of Materials and Supplies: Methods of Machine Inventory Accounting Records

General Accounting Committees

Open meetings for discussion of reports submitted Tuesday afternoon, and related topics

Machine Applications for General Accounting.
Internal Auditing:—Internal Audits of Fixed Assets; Of a Purchasing Department; Of Cost-Plus-a-Fixed-Fee Contracts; Of a Stores Department
Functional or Responsibility Accounting
Methods of Payroll Distribution
Protection and Preservation of Records
Licensed Project Accounting and Reporting (members only)

Property Records Committees

Grouping Items of Plant Into Pricing Units
Use of Trial Unit Prices in Pricing Units of Property

Depreciation Accounting Committee (E. E. I. only)

Use of Judgment in Estimating Life Characteristics of Depreciable Property

Taxation Accounting Committees

Continuation of Discussion of Current Tax Problems

Customer Activities Group

"They Like to Pay the Easy Way"—Film
New Developments in Electric Tabulating Card Operations for Customer Accounting and Billing
Techniques of Customer Sampling
Accounting Development Service — Interim Report
"By Jupiter"—Film

Rosco Chapman, Duquesne Light Company Employee, Wins Carnegie Hero Fund Silver Medal

SAVING a co-worker from a 250-ft. fall from the top of the smokestack at Stanwix plant of the Allegheny County Steam Heating Company last May won P. Rosco Chapman, boiler repairman at the Brunot Island Power Station of the Duquesne Light Company, Pittsburgh, Pa., *the only silver medal awarded* by the Carnegie Hero Fund Commission during 1947. The co-worker is Samuel L. Hopkins, also a boiler repairman at Brunot Island, and it was the second time that Mr. Chapman had saved him from a probably fatal fall. The medal was presented to Mr. Chapman on January 29.

The rescue which won Mr. Chapman the Carnegie medal happened last May 15, when Mr. Chapman was directing a crew that was painting the smokestack of the Steam Heating Company's plant.

A crew of four men—Mr. Chapman, Mr. Hopkins, H. L. Whittaker, and M. F. Kopas, Jr., all of Brunot Island Power Station, were assigned to paint the top six rings or courses of the external steel plate surface of the smokestack.

Hopkins had seated himself in one of the boatswain chairs, suspended from the top of the stack and was in the act of buckling the safety belt of the chair around his waist when, suddenly and without warning, the canvas web strap tore completely apart under him, allowing the wooden seat to fall to the roof of the plant almost 250 ft below. Hopkins frantically grasped the severed seat straps above his shoulders up close to the suspension ring, and supporting his entire weight with his two hands, endeavored to hold on. He was wearing paint-smeared gloves, which prevented his getting a secure grip on the straps, and despite his desperate efforts, his hands slowly slid down the strap.

Chapman hastily descended the six-foot ladder, fastened over the top of the stack for access to the chairs, placed his back to the ladder, twined his feet and legs through the lower rung of the ladder, and leaned out and over and grasped Hopkins' wrists, stopping Hopkins' descent.

Chapman next succeeded in removing the paint-smeared glove from Hopkins' right hand, and then swung Hopkins over toward the ladder, so that he could transfer his grasp to the bottom rung of the ladder. The two men, working together, slowly worked Hopkins' grasp up the rungs of the ladder until he could get his feet on the lowest rung. Trembling with shock, Mr. Hopkins, assisted by Mr. Chapman, made his way to the top of the short ladder. There the two men rested until they could move around to the permanent ladder, which they descended to the roof.

Several years ago, Mr. Chapman rescued Mr. Hopkins, while they were working on a flag-pole on Brunot Island.

The Inspection, Testing and Maintenance of Electrical Equipment for Stations and Substations

By A. C. Baumann and R. H. Mertz
The Detroit Edison Company

A paper presented before the Electrical Equipment Committee Meeting, EEI, held in Cincinnati, Ohio, on February 12, 1948

THE purpose of this paper is to outline The Detroit Edison Company practice in inspection, testing, and maintenance of electrical equipment for stations and substations.

In general, electrical equipment intended for use in stations and substations is given a mechanical inspection and electrical tests when received new from the factory, after rehabilitation when received from the field, and at regular intervals while in service in the field. The aim is to detect and correct defects in the equipment before they cause major damage or service failure. Equipment such as power transformers, voltage regulators, lightning arresters, insulators, bushings, and oil circuit breakers is included.

We feel that in giving you a report on inspection and tests made on this equipment, we should include all three of the conditions, namely, at the shop, in the field at time of installation, and at regular intervals. This will give you a better-balanced knowledge of our program as in the case of some equipment we may place more emphasis on inspection and test at the shop, while in the case of other equipment, we may place more emphasis on work in the field either at the time of installation or at some later period.

Definition of Terms

Before proceeding further, it would be well to mention several items such as the various voltages at which our equipment operates, some of our operating practices, and definitions of some of the terms used.

Our distribution system operates at 4800-v ungrounded; the sub-transmission system at 24,000 and 40,000-v grounded solidly, and the transmission system at 120,000-v grounded solidly. The paper does not deal directly with work in the power houses; however, power house practice is very similar to station and substation practice. The word "used" in expressions such as "used transformer" is frequently found in the paper and applies to all equipment that has seen service.

Relocating Used Equipment

When used equipment is moved, it is generally routed through the shop for rehabilitation before being reinstalled at a new location. The reasons for moving equipment are such as: improper capacity because of load change, rebuilding of the station or substation, or development of a defect that cannot be corrected in the field. Equipment, such as transformers and regulators, moves rather frequently. Records indicate that where our transformers and regulators have been moved, they stay in one location for periods about as follows:

Transformers 100 to 500 kva, 24 and 40 kv.....	4 years
Transformers 1000 to 4166 kva, 24 and 40 kv.....	6 years
Transformers 6000 to 10,000 kva, 24 kv.....	14 years
Transformers 5000 to 33,333 kva, 120 kv.....	7 years
Regulators 30 to 166 kva, 4.8 kv	6 years
Regulators 200 to 1000 kva, 4.8 kv.....	9 years

Some transformers and regulators have never been moved so they do not appear in these figures.

One exception to the routing of used transformers to our regular maintenance shop is the case of large capacity 120-kv transformers which are too tall for the shop crane. These transformers generally are routed through a power house where the crane facilities are adequate. The test facilities are not quite so elaborate at the power house, but we do make sufficient tests to satisfy ourselves that the equipment is in good condition.

Now a few words about our work at regular intervals on equipment in the field. Where there are satisfactory load transfer facilities the work is done every two years. In general, substations over 3000-kva capacity, and about 25 per cent of those that are 3000 kva and under, supplying miscellaneous power and light have transfer facilities. All 120-kv stations have these facilities. Where substations do not have transfer facilities, the periodic maintenance inspection and testing is done every five years. At this time the load is switched to a portable substation, and the regular substation is shut down. The word "periodic" in the tabulation means every two or every five years depending on the facilities unless another period is indicated.

The work indicated in Table I on page 48 is done primarily by maintenance men, inspectors, or test engineers. In addition, the operator makes regular inspections and if he observes any unusual condition, such as high temperature, oil leaks, breaker distress from automatic operation during trouble, foreign objects near energized wires or terminals, and is unable to correct the condition, he sends in an emergency or urgent report depending on the seriousness of the trouble.

Rehabilitation Program for High-voltage Bushings

For a period of around ten years before the war, we did considerable rebuilding of old 25-, 34.5-, and 138-kv bushings. Tests indicated trouble in some of these bushings and the service failure rate was increasing. A more intensive test and inspection program was then set up which consisted mainly of a power factor and megger test, a hot rod test for moisture in the compound of compound-filled bushings, and a di-

TABLE I — INSPECTION, TESTING AND MAINTENANCE OF ELECTRICAL EQUIPMENT

As Practised by the Detroit Edison Company

In the Shop		In the Field at Time of Installation		In the Field - Periodic	
Inspection and Conditioning	Electrical Tests	Inspection	Electrical Tests	Inspection	Electrical Tests
New Transformers					
Inspect for shipping damage, check ratio adjusters, connections, clearances, creepage, foreign material (1). Check tank fabrication, nitrogen system, and tap changing equipment on regulating transformers. Equip for installation (2). Oil pressure test tank and cooling coils.	No load loss, load loss, impedance, exciting current, insulation resistance, high potential, winding ratio, polarity, winding resistance, radio interference, audio noise, oil tests, and control on regulating transformers.	Check clearances, connections, ground connections, oil level, oil leaks, nitrogen system, conductor size, fanouts in potheads, and grounding disconnects.	Megger assembled unit. Final check on control on regulating transformers. Phase-in.	Inspect interior for sludge (3), loose connections, loose or broken parts. Inspect oil level indicator. Inspect and pressure test water cooling coils. Check exterior. (Also see bushings.)	Megger bushings, windings, and wood parts. Test oil dielectric and temperature indicator yearly. When taps are changed, measure ratio and winding resistance.
Used Transformers					
Determine condition of oil. Untank. Inspect core and coils and clean if necessary. Check ratio adjusters, tap changers and connections. Clean tank (4). Clean and pressure test water coils. Regasket and equip for installation (2). Oil pressure test. Paint. Improve some units (5).	Same as new, except no measurements for audio noise or copper loss. Ratio checked only on taps being used.	Same as new.	Same as new.	Same as new.	Same as new.
New Voltage Regulators					
Same as transformers plus alignment and lubrication of gears and bearings.	Same as transformers.	Check clearances, connections, ground connections, oil level, oil leaks, conductor size, and controls.	Same as transformers.	Check control every year. Inspect and pressure test water cooling coils. Gears and bearings lubricated periodically by the operator.	Check temperature indicators every year. Test oil dielectric on all outdoor regulators and water cooled indoor regulators every year.
Used Voltage Regulators					
Same as used transformers, however, more tanks need cleaning, and bands and wedges frequently must be tightened. Equip for installation (6).	Same as new.	Same as new.	Same as new.	Same as new.	Same as new.
New Oil Circuit Breakers					
4800-volt breakers. Check linkage, mechanism, clearances, creepage. Electrical operation including operation at low control voltage. Most larger breakers go direct to the job. (See inspection at installation.)	Megger bushings, lift rods and guides. Oil tests. (Also see bushings.)	Check linkage, toggle, and stop adjustments, contact setup, electrical and mechanical clearances, guides, breaker stroke, current transformer installation, closing mechanism, auxiliary switch adjustment, and contactor. Electrical operation including operation at low control voltage.	Megger bushings, lift rods, and guides. Speed and travel record. Check operating time and conductivity. High potential test on indoor breakers.	Check mechanism and electrical operation including operation at low control voltage. (Also see bushings.)	Megger bushings, lift rods, and guides. Check operating time and conductivity. Speed and travel record, (H type only). Oil dielectric test 24 hours after each auto opening except 4.8-kv breakers. 120 kv every year or after six auto openings. 24 and 40 kv every 2 years or after six auto openings, except H type every two years or after each auto opening. 4.8 kv after twelve auto openings.
Used Oil Circuit Breakers					
Check mechanism and pole unit linkage. Regasket if necessary. Paint. Electrical operation, including low control voltage conditions. Improve some units (7).	Megger bushings, lift rods, and guides. Speed and travel record. Check operating time and conductivity. (Also see bushings.)	Same as new.	Same as new.	Same as new.	Same as new.
New Arresters					
Inspect porcelain, hardware, and connectors.	Test samples only. 6000-volt line-type get impulse, voltage withstand and radio interference	Inspect visually, porcelain, hardware, connectors, location, and mounting.	Megger along with equipment which they are protecting.	Inspect visually, porcelain, hardware, and connectors.	Megger along with the equipment which they are protecting.

Paint. Electrical operation, including low control voltage conditions. Improve some	Check operating time and conductivity. (Also see bushings.)				
New Arresters					
Inspect porcelain, hardware, and connectors.	Test samples only. 6000-volt line-type get impulse, voltage withstand and radio interference test. 20 kv and up get impulse test.	Inspect visually, porcelain, hardware, connectors, location, and mounting.	Megger along with equipment which they are protecting.	Inspect visually, porcelain, hardware, and connectors.	Megger along with the equipment which they are protecting.
Used Arresters					
Clean and inspect for defective porcelain, caps, connectors, and leads.	Test all used arresters. The tests are the same as for new arresters.	Same as new arresters.	Same as new.	Same as new.	Same as new.
Used Arresters Obsolete Station Type					
				Check for corroded rain shields and frame work, wet wood parts, and treeing of composition tubes. Check external gap. Oxide film and mica spacer autovalve outdoor, every three years. Indoor every five years. Composition tubes annually.	Megger wood parts, composition tubes, and individual units of mica spacer autovalves. Charging test on Oxide film cells.
New Insulators					
Visually inspect porcelain, cement, and hardware.	Apply 60 cycle and high frequency flashover test to disconnect and bus support insulators. Insulators of the type commonly used on overhead lines construction get no electrical test.	Visually inspect porcelain, cement, hardware, location, and mounting.	Indoor insulators will get a high potential test as a part of an overall bus test.	Clean and inspect porcelain and cement. 24- and 40-kv outdoor at the regular period except more frequently in heavy deposit areas, indoor every five years. 120 kv every year.	High potential test on 24- and 40-kv outdoor buses. Capacitance measurement every five years on 120-kv disconnect insulators.
Used Insulators					
Same as new.	Disconnect and bus insulators same as new. Insulators commonly used on overhead lines construction are given a high frequency test.	Same as new.	Same as new.	Same as new.	Same as new.
New Bushings					
Visually inspect porcelain, cement, hardware, and gaskets. Oil pressure test.	Megger, power factor, capacitance, radio interference, flashover and high potential.	Visually inspect porcelain, cement, hardware, gaskets, and oil leaks.	Megger. Indoor bushings will get a high potential test as part of other equipment especially if it has been a field assembly job.	Clean and inspect visually for cracks, leaks, poor gaskets. Pressure or hot rod test.	Megger. Test oil dielectric on 120 kv every four years.
Used Bushings					
Many old bushings dismantled. Clean parts, test stud. Some studs dried. Reassemble with new gaskets. Oil pressure test.	Same as above for assembled bushings. Some of these tests are also made at various stages of the reassembly of rebuilt bushings.	Same as new if reconditioned in shop, if not, make pressure or hot rod test.	Same as new.	Same as new. Inspections are made when the major equipment such as transformers and breakers are inspected.	Same as new.

1. In general, units 500 kva and up are inspected at factory when tanked and are inspected at our shop only by access through manhole when installing bushings.
2. Equipping for installation includes installation or removal of potheads and grounding disconnects, installation of magnetic oil gauges and proper type connectors on bushings.
3. If a transformer has been at one location for ten years and has been heavily loaded, a special order will be issued to lower the oil during the next regular inspection so that the core and coils can be examined for sludge deposits. During the normal periodic inspection, the oil is lowered just enough to permit disconnecting the bushings for megger test.
4. All tanks are wiped clean inside. Cooling tubes are checked and if necessary inside of tank and cooling tubes are cleaned with a solution.
5. Some old units are rebuilt to improve clearances and insulation or to brace leads, also gasket stops and retainers are installed. In order to remove the oil hazard in case a bushing breaks on flashover the conservator system on many transformers is removed and a nitrogen system is installed or the unit is sealed.
6. Many indoor units are equipped with hoods for outdoor service.
7. Improvement includes raising height of breaker for safety, rebuilding current transformers with continuous leads, installing connection boxes and double extra strong pipe control rods, and changing control panel and wiring.

electric test of oil in oil-filled bushings.

The bushings in the poorest condition were rehabilitated first, but as the program progressed all of certain types were rebuilt. By the start of the war, the program had passed the peak, but work is still being done as the need develops. In the case of one vendor's 138-kv bushing which was oil filled, the rebuilding consisted of dismantling, cleaning, replacing paper tubes with Herkolite tubes, reassembling, regasketing, and filling with new oil. In the case of another vendor's bushing which was compound filled, only the condenser-type stud was used and an entire new oil-filled bushing built. The paper-wound stud was tested, dried under vacuum, and restepped to balance the condenser layers. The cemented porcelain shells were replaced with new one-piece shells. When completed this bushing is oil filled with nitrogen pressure on top of oil with a pressure gage at the flange and there is no oil-level indicator. We favor a pressure gage over an oil-level indicator because the pressure gage which is convenient for the operator to see at all times, gives an indication of the condition of the bushing whereas considerable water would have to get in before it could be detected on an oil-level gage. This bushing now tests up much better than the original bushing. In the program of rehabilitating bushings, the prime aim is to get tight seals so that moisture will not get inside.

As the program of rehabilitating old bushings tapered off we discontinued power factor testing in the field. During this period of field testing, we found that a 2500-v, 10,000-megohm megger would pick out most of the defective bushings that a power factor test would indicate. With the megger being more simple to use we have relied on it for the past several years. Also the war was on and we were eliminating all work that we possibly could. If our work levels off some time in the future, we will probably resume power factor testing in the field, at least to the extent of sample tests here and there.

Program for Maintaining the Quality of Insulating Oil

Dielectric, neutralization, power factor, and pour point tests are made on insulating oil at the shop. If the oil contains too much moisture or is dirty, it is put through a blotter press or centrifuge. If the measurement for acid or power factor is too high, it is refined through a Honan Crane Refiner.

Oil tests in the field normally consist of the dielectric test, but if the oil appears to be in a questionable condition, samples are sent to the shop for the more complete tests.

Recently we have also been sending samples of borderline oil on to our Research Department for Interfacial Tension tests. They have been experimenting with this test and think it has considerable promise.

There has been considerable discussion as to the value of a power factor test on insulating oil. We started testing oil for power factor because we could not get a satisfactory test on a bushing mounted in an oil circuit breaker if the breaker oil had high power factor. To get a satisfactory test it was necessary to lower the oil level so the lower end of the bushing did not make contact with the oil. This was requiring considerable extra work, so it was decided to control the power factor of oil in this equipment.

Very little oil is handled or processed in the field because we have been able to keep the equipment tight. In the year 1946, on yearly periodic dielectric oil test, no test below 20 kv was obtained in testing 438 high-voltage breakers, 842 station transformers, 456 regulators, and many pieces of miscellaneous equipment. This was a better than average year although in an average year water is found in only three or four pieces of equipment. We feel that being able to keep the equipment tight is paying off as it results in less oil processing and in turn fewer equipment failures from moisture.

We have very little trouble resulting from oil sludge. The average unit of equipment gets into the shop every six to nine years, and at this time the oil is put into good condition. If the field inspection indicates that the oil in a unit is in a condition to sludge, an effort is made to replace it before extensive sludging actually develops.

Special Load Tests on Equipment in the Field

In addition to the work shown in the tabulation, we occasionally make a load test on a station under emergency conditions to determine if it will actually carry the emergency load without developing an extreme temperature. One common emergency arises when one unit of a substation trips out and the load must be carried by the other unit or units. At the present time, the load exceeds the firm rating of a few of our substations and it is just not practical to increase the capacity of all of them immediately due to the pressure of work and shortage of material.

In some cases the bottleneck is rather minor such as a set of disconnect switches, an oil circuit breaker, or a section of conductor. In order to determine if this bottleneck can be tolerated for say another year, we may operate the station under emergency conditions for test through one load cycle. During this test we check the temperature of all the equipment involved. We may find some high resistance contacts or some part that is not properly radiating heat. Generally these bad conditions can be easily corrected. Considerable help can be obtained in nursing a station through an emergency by the use of portable fans or installations of water spray on equipment such as transformers and regulators.

Apparatus Acceptance Report

For many years we have worked closely with the manufacturer's engineers and designers to work out details such as gasketing, bushings, bushing ports, tank welding, and winding crossovers to keep maintenance to a minimum and to make it possible for our Maintenance Division to keep the equipment in good condition. Many of these small details may seem trivial but they frequently develop into major trouble. We have also attempted to keep the vendor informed of conditions found in new equipment.

If we find, while inspecting and testing a shipment of new equipment, that some details do not conform to the purchase agreement, we will expect the manufacturer to make a correction or adjustment. Based on our operating experience, we may feel that certain changes in construction, not covered by the purchase agreement should be made, which if practical, we may make on our own responsibility. These findings are incorporated into an Apparatus Acceptance Report and forwarded to the manufacturer.

The manufacturer frequently does not agree with us in these items, but sometimes he does agree to the extent that he will incorporate them in his own specifications. A report of this kind gives us an organized way of getting our experiences with equipment back to the manufacturer. We believe that this will be quite helpful to him in his aim to build the best equipment for the job.

Twenty E. E. I. Resuscitation Medal Awards Earned by Alert Power Co. Employees

By Mae B. Woods

Secretary, Committee of Judges, Edison Electric Institute Medal

TWENTY awards of the Edison Electric Institute Medal for Resuscitation were made during 1947 to electric company employees who were alert on the job and skilled in procedures for giving artificial respiration. These presentations brought the total number of awards to 227 since the inception of the award in 1933.

This past year, as in all previous years of the Edison Medal's 14-year history, the details in the record of these cases pay tribute to the presence of mind and clear thinking which characterized the actions of those to whom the awards were made.

To honor those whose names appear on the following pages as recipients of the Institute's Edison Medal, the circumstances of their cases are presented. In addition the evidence of the effectiveness of techniques of artificial respiration may well prove to be an inspiration to members of line crews, maintenance workers and operators who, never having been called upon to either perform or witness artificial respiration in an emergency, may sometimes question the worthwhileness of their regular drills in these methods for saving life.

But there is another service rendered by these and all such cases to the great forward-moving effort in the industry toward the conservation of the industry's valuable man power and the control of its most serious type of accident—electric shock. Details concerning the circumstances under which the shocks were received show that in many cases the accident would have been avoided had the victim followed instructions, observed company safety regulations with regard to the use of protective equipment and adherence to clearance procedures, or exercised more caution in his movements in the work environment.

The significance of these considerations has been shown year after year as the records of the Industry's electric shock and burn accidents have been studied. Emergency work during and in the wake of summer and winter storms is fraught with its own peculiar hazards, some of which linemen find difficult to control. The records show, however, that only a small percentage of the electric shock accidents occur at such times. Rather is it on the everyday work that the lineman, and sometimes the substation operator or electrician, drops his guard and exposes himself to danger.

To the victim of shock who has received prompt and efficient first aid from a fellow worker, the means by which the accident could have been avoided is all too clear—afterwards. These cases should serve as dramatic reminders of the fact that chances cannot be taken and that safety can at all times be assured if there is consistent use of rubber protective equipment and faithful day-by-day observance of the practices which have come out of experience.

Data on other resuscitations recently sent to the Institute are now being considered by the judges for awards. The committee consists of Wills Maclachlan, Toronto, Canada; J. M. McCann, Boston, Mass., and W. R. Smith, Public Service Electric & Gas Company, Newark, N. J.

Employees of all electric light and power companies are eligible for the Edison Medal. A certificate describing the resuscitation, signed by the President of the Institute, is presented with each medal. Certificates of Assistance are awarded to those who have rendered valuable aid in the resuscitation. Miniature medals and certificates are also awarded to members of line crews who have participated in cases of successful resuscitation.

Brief statements of the circumstances leading to the awards made in 1946 follow:

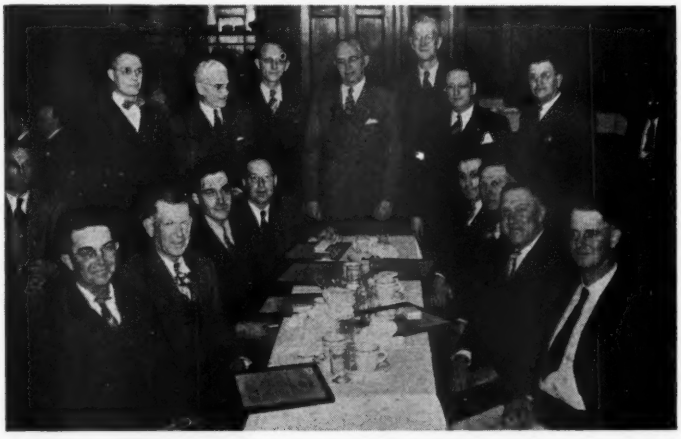
MATTHEW M. McDONOUGH'S LINE CREW

Ohio

Early on the afternoon of July 14, 1947, a line-crew of the Cincinnati Gas and Electric Company, under the foremanship of Matthew M. McDonough, was sagging conductors on the Goshen-Wilmington Road just south of Butlerville, Ohio.

The crew, consisting of James F. Rider, Pearl C. Byus, John W. Conley, Ernest A. Owen, Louis N. Clark, Albert H. Harper and Victor E. Gose, had completed the operation of stringing and sagging a primary neutral conductor from Black Hawk substation to Morrow-Rossburg Road. Two workmen, on the same pole, were pulling the slack in these conductors when it was noticed that one conductor was not pulling through the tie-wires on the first pole south.

Rider was told by the foreman to unserve the tie enough to allow slack to be taken up



The Loveland line crew of the Cincinnati Gas & Electric Co., who were awarded the Edison Medal, are seated here left to right: MATTHEW M. McDONOUGH, JR., ERNEST A. OWEN, ALBERT HARPER, JOHN W. CONLEY, John L. Grier, Lee O. Simpson, LOUIS N. CLARK and VICTOR E. GOSE. PEARL C. BYUS, another crew member, was not present.

and make the tie-up permanently when the wire had been brought up to sag. He proceeded to carry out the instructions, but climbed the pole with rubber gloves and started to do the work without any other protective equipment. He was completing a permanent tie when his right forearm came in contact with the conductor just beyond the cuff of the rubber glove. The shock caused loss of consciousness when his arm made the contact and his left leg lay on and supported a grounded guy wire.

When McDonough saw Rider's condition, he told Conley to cut both energized conductors to clear Rider from the circuit. Meanwhile, Clark backed the truck while Gose got a rope to lower Rider from the pole. Owens had started to climb the pole, followed by Byus and Conley. Because of the congested condition of the pole, McDonough ordered these men not to attempt resuscitation until the victim had been lowered to the ground. The crew men had obtained a tarpaulin and readied it for the instant that Rider was on the ground. He was placed on the tarpaulin and Clark began resuscitation by the prone pressure method.

Resuscitation was continued for about five minutes before there were signs of voluntary breathing. Four minutes more elapsed until Dr. A. F. Lippert and an ambulance arrived.

The victim was removed to the Good Samaritan Hospital, Cincinnati, where he died 20 minutes after having his right arm amputated due to the shock.

The Edison Medal, miniature medals and certificates were awarded the line-crew at a luncheon held for employees Dec. 12, 1947, at Cincinnati.

A. M. WALKER and JOHN GASTON
Idaho

On the morning of March 20, 1947, a crew of the Idaho Power Company, under the supervision of A. M. Walker, and consisting of Billy Reed, John Gaston, P. Brown, J. Booth, Billy Morton and J. Sooter, were charging out a secondary in an alley in New Plymouth, Idaho.

A new pole had been set in the line and a transformer rack built, upon which had been placed two transformers, neither of which had been connected to the primary. The old transformers were in place on the old pole and were hot, but the primary leads were rubbered. Billy Reed was on the transformer rack location ready to thread the new secondary through the secondary racks. He had been placed at this location as it was the only pole job that did not entail the handling of hot wires. Reed understood the job and had worked on the pole the day before. Reed strung one wire through the racks and was going back from the south pole to the north pole, when in some manner he made contact with the secondary bus connecting the two hot transformers.

Billy Morton was acting as groundman for Reed, who had just told him that he had replaced a secondary lead in the east transformer which he had accidentally pulled out. Morton turned to put his hand line on the secondary preparatory to sending it up to Reed when he heard the arc. He saw Reed slump against the west transformer but did not see how the accident occurred.

Walker was under the pole, but his vision was obstructed by the transformer rack when the contact was made. Sooter, who was working on the pole north of the transformer rack, also heard the arc but did not see the accident happen. Walker went up the pole and proceeded to administer pole-top resuscitation until the other men could get on the rack. Reed was then lowered through the secondaries to the rack where he was given prone pressure resuscitation by Walker and Gaston. He was then taken to the hospital in an ambulance.

After the accident it was discovered that the rubber blanket on the west transformer bushing was pushed back, exposing some of the primary lead. The rubber was put on for protection for some primary work that had been done earlier the same day, and Sooter said that the blanket was in place when he had worked on the pole earlier.

T. E. Roach, executive vice-president and general manager of the Idaho Power Company, presented the Edison Medal to Aaron M. Walker and John Gaston, and certificates of assistance to Bill Morton, Jack Sooter, P. M. Brown and J. Booth at the annual western division employee dinner at Weiser, Idaho.

RUSSELL SARRINE
Michigan

A severe storm caused a break in one of the conductors of a 4800-v three-phase circuit of the Consumers Power Company, Saginaw, Michigan, on the evening of June 10, 1942. The wire was lying in the street near the northwest sidewalk corner still energized and arc-ing. A group of people were standing on the east side of the wire, about in the center of the street, watching it.

Shortly after 10:30 p.m. a group of young women, among them Ruth Carpenter, a cripple, approached from the south, walking in the street because of the depth of the water in the gutter. As they prepared to remove their shoes so that they could wade through the deep water to the northwest curb, a passenger car approached from the west. The driver saw the women but did not see the live wire. The bystanders called out in vain and the car struck the live wire. The women ran to get out of the way of both car and wire. Miss Carpenter, the crippled woman, not quite so agile as her companions, was struck by the wire and fell unconscious in the gutter.

The victim was cleared of contact through the use of a wooden clothes pole obtained from nearby. At about this time, Russell Sarrine, employee of the Consumers Power Company, who lived next to the corner to the west, heard the commotion, dressed and went to the scene of the accident. He immediately placed the victim in position on the sidewalk and started artificial respiration by the prone pressure method. Signs of recovery were evident in about fifteen minutes and she began to breath naturally within twenty minutes. Assistance was rendered

T. E. Roach, executive vice-president and general manager of the Idaho Power Company, (left) presents the Edison Medal to JOHN GASTON (third from right) and A. M. WALKER (right).

RUSSELL SARRINE (left) receives the Edison Medal from H. J. Neilson, (right) Gas Transmission Supt. of the Consumers Power Company as H. L. Fruechtenicht and D. E. Herringshaw look on.

W. LEON FRANKLIN (center), inspector for the Birmingham Electric Company receives the Edison Medal for saving the life of Joseph P. Acker (left), presented by N. H. Hawkins, Jr. (right), vice-president in charge of operations.

H. W. Tice (left), vice-president of Southern California Edison Co., Ltd., looks on as R. Mitchell, lineman, congratulates FRANK W. SOTO (second from right) on receiving the Edison Medal, and Lawrence Gansey (right) the certificate of assistance. The award winners saved Mr. Mitchell's life.

by members of the police and fire department who arrived at about the same time as Sarrine.

The Edison Medal was awarded Sarrine at a dinner held February 24, 1944, at the Travellers' Inn, Bridgeport, Mich., by H. J. Neilson, gas transmission superintendent of the Consumers Power Company. An account of the presentation was carried in the *Saginaw News*, February 25, 1944.

W. LEON FRANKLIN
Alabama

A trouble crew of the Birmingham Electric Company answered a call and were preparing to repair a transformer structure at Rickwood Park, Alabama, in the Birmingham suburban area, on the afternoon of July 2, 1947. Foreman C. E. Crow saw that all 13,000-v fuses had been blown, two of the 13,000-v phase wires between the switch and fuses were burned in two and the pole supporting the 13,000-v switch was on fire. He told Joseph P. Acker, his assistant, to do nothing until he went to a nearby house and telephoned to have the 13,000-v line killed. While Crow was gone, Acker, contrary to his foreman's instructions, climbed the burning pole.

After Acker had climbed to a position even with the transformer supports and the operating handle of the switch he attempted to place his right arm around the pole just above the transformer support. In doing so his arm came in contact with the steel transformer support while his chest contacted the switch handle, all of which were energized. He fell to the ground, unconscious. Meanwhile, Crow, having completed his call, heard the roar of the electric arc and rushed back to the foot of the pole, where he found Acker's body.

At this time W. Leon Franklin, Inspector for the company, arrived in answer to Crow's call. Inspector Franklin at once began artificial respiration by the prone pressure method and in a short while Acker began to breathe normally and regained consciousness. He was placed in an ambulance and removed to St. Vincent's Hospital, where he was treated for third-degree burns on the underside of his right elbow and blisters over the entire chest and both arms.

Before a group of 300 Birmingham Electric Company employees, Mr. Franklin was awarded the Edison Medal for successful resuscitation by N. H. Hawkins, Jr., vice president in charge of operations, on November 18, 1947. An account of the rescue and the presentation was carried in the *Birmingham News* on the same day.

FRANK W. SOTO
California

In the late afternoon of April 11, 1946, a linecrew of the Southern California Edison Company, Ltd., were finishing a new transformer installation at Bell Gardens, California. Frank W. Soto, foreman, had linemen Robert J. Mitchell and Lawrence Gansey, groundman Robert L. Boynton and apprentice lineman T. C. Ravencroft working with him on the job.

It was rapidly growing dark and Soto climbed the pole to assist the two linemen who were then working at the top of a 40-ft pole. Soto was working on the secondary taps of the two 10-kw transformers which hung on the primary line arm while linemen Mitchell and Gansey were connecting the 4-kv cutouts to the energized line.

In some manner Mitchell made contact with the 4-kv conductor and was held by muscular contraction to the wire. Gansey endeavored to free him by pushing him away from the conductor but finally cut the wire and the stricken man slumped down in his safety strap.

Soto heard Gansey call and immediately climbed up the pole to a position just below Mitchell. He immediately started artificial respiration by the pole-top method while Gansey cleared the victim's throat of artificial dentures and his tongue.

After several respiration strokes were administered him, Mitchell started to breathe and large amounts of mucous came from his mouth and nose. He again stopped breathing and Soto re-applied artificial respiration. This happened twice before Mitchell seemed to be breathing normally. After about ten minutes, although he appeared to be delirious, Mitchell was lowered to the ground by a line. When he had been on the ground about fifteen minutes he regained full consciousness and asked for a cigarette. The line crew applied first-aid to his burns while awaiting the arrival of an ambulance.

At the Angelus Emergency Hospital Mitchell was treated for a burn on the inside of his left thigh and on the underside of his right forearm. The secondary wire on a line arm, four feet below the primary arm, had been covered with a line hose which Mitchell apparently removed just before the accident. This secondary wire was in contact with his left thigh while his right arm made accidental contact with the primary wire. He was wearing rubber gloves and was standing with one climber in the pole below the secondary arm.

The Edison Medal for successful resuscitation was awarded Foreman Soto and a certificate of assistance to Lineman Gansey on December 10, 1946, by H. W. Tice, vice president of Southern California Edison Company, Ltd., at its Montebello, California, district office.

H. F. HURLEY
New Jersey

A linecrew of the Jersey Central Power and Light Company was removing a transformer from one pole at Valley Road, Monmouth County, N. J., and transferring it to another pole on the afternoon of August 26, 1943. In the crew were Foreman L. F. Breed and linemen H. F. Hurley and W. B. Breed. The pole to which the transformer was to be transferred was to be changed from single-arm to double-arm construction.

There were four primary wires on the cross arm, two secondaries on one side and one on the other. Hurley covered all wires including the guy wire and when this was completed W. B. Breed came up on the south side of the pole. Hurley had a hacksaw sent up from the ground. He cut the head of the

BURTON J. SMITH (center) receives the Edison Medal from John P. McCann, Safety Manager of the New England Power Service Company for the successful resuscitation of James Griffin (right), the linecrewman who was the victim of the accident.

bolt on the cross arm and got ready to knock the bolt through toward Breed. Before he started this operation he had removed his rubber gloves and had only work gloves on, as did W. B. Breed. The new bolt was used to drive the old bolt half way through the pole. Breed was on the side with the old arm. The new arm came up and Hurley had it across his belt and entered the field bolt. W. B. Breed was handling the road bolt.

As the men were trying to work the bolts into place, Hurley heard an arc and saw that Breed had, in some way, while reaching under the arm to guide the bolt into the hole, contacted the 4150-v line as the bolt was pushed up under the hood. His left hand and arm were under the old cross arm. Hurley dropped back in his safety belt and kicked Breed loose with his left foot. Breed dropped clear and Hurley swung under him and applied pole-top resuscitation for about four minutes.

Meanwhile L. F. Breed came up the pole and assisted in getting him down to the ground. After being lowered to the ground W. B. Breed appeared to be in good condition and was immediately taken to a doctor who treated him for burns and shock and sent him home.

Mr. Hurley was awarded the Edison Medal at a sectional safety dinner in Hightstown, N. J., on February 14, 1944. Mr. H. D. Polhemus, executive vice president of the company made the presentation and delivered the feature address.

BURTON J. SMITH
Rhode Island

In a suburban area of Warwick, R. I., on the morning of June 26, 1946, a New England Power Service Company linecrew and a similar crew from the Narragansett Electric Company were engaged in making changes to improve electric distribution construction.

Linemen James Griffin and Burton J. Smith were working on a pole with James E. Handy and Charles E. Fleury attending as groundmen near the base of the pole. Foreman John E. Healey, and other members of his crew were busy with details of line work at nearby locations.

Griffin and Smith had removed a double six-pin primary buck arm and were preparing to replace it by a double eight-pin arm in a new lower position on the pole. One 4000-v wire and the primary neutral wire were held in grips attached to two insulator pins on a crossarm higher up on the pole.

In order to get into position to handle the new crossarm which Handy and Fleury were sending up, Griffin straddled the secondary neutral wire. Then, in moving about slightly, he brushed his shoulder, covered by a sweat-soaked shirt, against a section of the 4000-v wire not protected by line hose.

Unconscious and helpless, Griffin fell back with his neck firmly against the 4000-v wire. This contact teamed up with the other contact at the inside of his right leg against the secondary neutral wire provided a perfect path to the ground.

Smith heard the roar of the electric arc and saw Griffin frozen to the wires. He swung around the pole by his safety strap into a position partially behind Griffin, knocked him clear of contact, pushed the primary wire out of the way, grasped him around the waist from behind and started pole-top resuscitation.

Within three minutes there were signs of life from the victim but Smith continued the pole-top method. Meanwhile, Fleury and Handy had also heard the arc and had seen what followed. They called to Peter Corliss, their truck driver, one pole section away, who ran one section farther and summoned Foreman Healey to the scene. Healey told Corliss to call other men nearby. Also responding were the line crew members of the Narragansett Electric Company under Foreman Michael E. Tulley.

Arriving at the pole about one minute from the time of the accident, Healey told Smith to continue pole-top resuscitation. Lineman Fabian S. Gendreau of Healey's crew and lineman Joseph P. Bradley of Tulley's crew were sent up the pole. As Smith continued resuscitation they rigged Griffin's safety belt and strap with a rope, making a "saddle-hitch" sling and lowered the man to the ground. Four or five minutes had elapsed and Griffin was rapidly regaining consciousness and ability to breathe naturally.

Placed on a blanket, Griffin was given assistance in breathing by the prone pressure method until the arrival of an ambulance. Ointment was applied as first-aid for the victim's severe burns. Handy and timekeeper Howard Cutler rode in the ambulance to the Rhode Island Hospital in Providence, but by then Griffin was breathing normally and seemed reasonably conscious.

The Edison Medal was presented to Burton J. Smith together with an accompanying certificate, signed by officials of the Institute, by Safety Manager John P. McCann of the New England Power Service Company at a dinner and meeting in Providence, on the evening of November 26, 1946.

J. A. HIGHTOWER and ASHBY C. HUCKABEE
North Carolina

On the morning of June 30, 1940, a linecrew of the Carolina Power and Light Company under the supervision of J. A. Hightower, was replacing a broken six-inch disc insulator in one of the tap line poles on a 6900-v rural line near Siler City, North Carolina. This work was being done by linemen Sam Adams and Ted Conder. The job was finished except for putting on hot line pinchers. The six-inch insulator being replaced was on a main line pole and was holding a tap line. The branch line was deenergized by removing a hot-line clamp, leaving the main line still hot.

When the new insulator had been installed, it was necessary to take up the slack of the wire. This was being done by tightening the nut on the eyebolt through the pole. Conder was turning the nut with an adjustable wrench and Adams was holding the bolt on the other side of the pole to prevent it from turning. In some way Conder's hand came in contact with the hot line. At the time Adams was touching him and the current passed through Adams, from his hands to the outside of his left thigh.

Both men fell clear of the energized parts and hung by their safety straps. Duncan L. Parsons, a crew member, who was on his way to the adjacent pole, turned when he was called by Hightower, who had heard the arc. Climbing quickly he reached the men just as Conder regained consciousness. Using rope and blocks nearby, Adams was lowered with Conder's assistance.

In approximately three minutes after the shock, Adams, who was still unconscious and not breathing, was receiving artificial respiration by the prone pressure method administered by Hightower and Ashby C.

Huckabee, another crew-member, who had also assisted in lowering Adams to the ground. Adams responded in about ten minutes and was soon breathing without assistance. The two men were made to remain quiet until the arrival of an ambulance and doctor, which took them to Siler City Hospital.

The Edison Medal was awarded jointly to Hightower and Huckabee, and presentation of the medal was made by S. Paul Vecker, vice-president of the Carolina Power and Light Company. Miniature replicas of the medal and certificates were given to both Hightower and Huckabee. Duncan Parsons was awarded a certificate of valuable assistance in the resuscitation.

An account of the rescue and also of the presentation was carried in the *News and Observer*, Raleigh, North Carolina.

R. E. LEMMA
Washington

Lineman G. W. Potter of the Pacific Power and Light Company had just finished installing a transformer on a three-wire 6900-v primary circuit in an alley in Wapato, Washington, on the afternoon of November 26, 1946. He was starting down the pole when in some manner his right hand came in contact with the 6900-v wire.

Foreman K. J. Alderson, on the ground near the pole at the time, heard the arc, as did lineman R. E. Lemma, who was working below Potter on the same pole. Lemma reached up, grabbed Potter's legs and pulled him clear of the hot wire and began pole-top resuscitation.

Alderson climbed the pole, opened the cutouts and tied a handline around the victim. Lemma worked over Potter for about five minutes before he responded. When he was finally lowered to the ground, James McMillan took over and continued artificial respiration by the prone pressure method for another five minutes.

In the meantime a doctor had been called and upon his arrival Potter was taken to a hospital in Yakima, Washington, where it was later found necessary to amputate his right middle finger at the palm.

Mr. Lemma was presented with the Edison Medal by J. E. Yates, safety supervisor, and L. W. Dick, district manager for the Pacific Power and Light Company, at the company's annual Christmas party at Yakima, December 19, 1947. An account of the rescue and the presentation appeared in the *Yakima Morning Herald* the following day.

R. E. LEMMA (center) receives the Edison Medal and accompanying certificate from L. W. Dick, district manager of the Pacific Power and Light Company (left), and J. E. Yates, safety supervisor.

CHARLES BEACH
New York

It was after 8:00 p.m. on the hot, sultry night of July 1, 1941, when lineman Jesse Kasch, of the Orange and Rockland Electric Company, stood on a roadway between Chester and Craigville, N. Y., peeling off the end of a tree wire preparatory to splicing out the conductor of a 2300-v, single-phase rural feeder which had been broken by falling tree limbs. Suddenly the end of the conductor slipped from his grasp, its bare end striking the inside of his right elbow. The electric shock knocked him to the concrete roadway, where he landed on the back of his head, the live conductor falling across his left chest.

Hearing the arc, emergency truck driver Charles Beach, ran from his truck to the scene of the accident. Otto Montanya, a farm laborer, had reached the victim first, however, and pulled the conductor clear of Kasch's body.

When Beach reached him the victim's face was blue and his eyes were turning dark. Quickly rolling him over on his stomach, Beach began artificial respiration by the prone-pressure method. For twenty minutes he labored before the victim showed any signs of life and it was 35 minutes before Kasch was able to breathe without assistance. He was moved to a sitting position in the back of the emergency truck, where he remained until removed to the Goshen Hospital. At the hospital he was treated for severe electrical shock, a large contusion on the back of his head, lacerations of the scalp and electric burns on his chest and right arm.

Beach was presented the Edison Medal by Roscoe W. Smith, company president, at a dinner for employees, held in Goshen on April 2, 1947. The presentation ceremony was reported in the *Middletown Times Herald* on the same day.

CHARLES BEACH (left), emergency truck driver for the Orange & Rockland Electric Company and Richard Hillas (right), lineman, receive Edison Medals from Roscoe W. Smith, Company president. The circumstances of the award to Mr. Hillas are not covered in this report.

CHARLES F. ROHRBACH, (seated at left) holds the certificate for the Edison Medal he received for saving the life of fellow-worker, Andrew Hutnyan (seated, right). John S. Davidson, division manager of Pennsylvania Power & Light Company, who presented the Medal, stands at the far right.

E. R. GRIMES (left), lineman trainee of the Oklahoma Gas and Electric Company is congratulated on receiving the Edison Medal by R. J. Corrick, whose life he saved.

CHARLES F. ROHRBACH
Pennsylvania

Andrew Hutnyan, lineman first class, of the Pennsylvania Power and Light Company, was preparing to dead-end a 4-kv energized conductor, supported by rope blocks on a pole in the village of Beaver Brook, Pennsylvania, on the afternoon of July 11, 1946.

When Hutnyan reached over the rope blocks to insert the end of the wire in the dead-end clamp, his left arm, above the gauntlet of the rubber glove, made contact with the energized hook of the rope block, while his right foot was in contact with the ground wire on the pole.

Troubleman Charles F. Rohrbach was walking toward the pole at the time of the accident and was told by foreman Andrew Novotnie to hurry to the pole, that Hutnyan had received a shock. In the meantime, Francis F. Quinn, who was working near the base of the pole, heard the arc, looked and saw that Hutnyan had made contact with the hook of the rope block. He ran to the pole and pulled on the fall line of the blocks, breaking Hutnyan loose from the contact, and causing him to fall back in his safety belt. After Quinn had shaken the victim loose from the hook of the block, he immediately placed a ladder against the pole. Rohrbach climbed up to Hutnyan and immediately applied artificial respiration by the pole-top method. After Hutnyan regained consciousness, a rope was attached to him as a support while he descended the ladder to the ground. He was then put in an automobile and taken to the Hazleton State Hospital.

In a formal ceremony in the company's Hazleton office, Rohrbach was presented with the Edison Medal by John S. Davidson, division manager of the Pennsylvania Power & Light Company, on September 30, 1947.

E. R. GRIMES, JR.
Oklahoma

In mid-afternoon of June 23, 1947, a line crew of the Oklahoma Gas and Electric Company was removing a single-phase transformer and hanging a 1-37.5-kva and a 5-kva to make a 3-phase station for the River Edge Farm, two miles west of Shawnee, Oklahoma. The circuit consisted of a hot 4160-v wire on the north end of the arms, one grounded neutral wire on the south end of the arms. A third wire had been strung in by a previous crew. The wire had not yet been made hot.

About 3:00 p.m. the crew was running a vertical bus to feed from the middle wire to the transformer and foreman R. J. Corrick was planning to bore a hole in the top arm for a transformer pin. He called for a brace bit and pin. These were sent up on the handline by V. M. Hutcherson. Corrick was on the north side of the pole, standing on the second set of double arms with his safety through the secondary rack on the north side.

Apprentice lineman trainee E. R. Grimes, Jr., was on the south side of the pole, sitting on the second set of double arms, running the horizontal neutral bus on the second arms.

He heard an arc and saw that Corrick had received a shock when he reached around the pole for the brace and bit on the handline. He saw Corrick straighten up stiffly and slump in his safety belt, his right foot between the second set of double arms. In the time Grimes could shout to Hutcherson and T. P. Donaghue he had gotten behind Corrick and began to administer pole-top resuscitation.

In about four minutes Corrick began to breathe and groan. Grimes talked to him reassuringly as he sat him on the second arms to rest. The men were about to lower Corrick to the ground, as he said he felt all right. When he reached the ground he began to vomit. In a few minutes a company official arrived in a car, took Corrick to a local hospital, where he was treated for several small burns and allowed to go home.

Mr. Grimes was awarded the Edison Medal at a dinner held for employees at Shawnee, Oklahoma, on December 19, 1947. Ralph Kumler, district manager for the Oklahoma Gas and Electric Company, made the presentation. An account of the occasion was carried in the *Shawnee News-Star.*

EVERETT MENASCO
Oklahoma

In mid-morning on August 23, 1945, a linecrew of the Oklahoma Gas and Electric Company was changing insulators and transformers on a 2400-v rural line, preparatory to cutting it over to 7.2-kv near Ada, Oklahoma.

As lineman A. R. Boyet was changing a dead-end insulator his hand slipped in tightening a clamp, with resultant severe contact burns to his arm and foot. He fell clear of the wire and sagged unconscious in his safety belt. Everett Menasco, then Ada line foreman, directing work across the road, heard the arc and rushed to the rescue. Linemen Ralph Moreau and M. L. Park lost no time in lowering the victim to the ground, where Menasco began applying artificial respiration by the prone pressure method. He worked for ten minutes before Boyet was able to breathe without assistance. An ambulance arrived and Boyet was removed to a nearby hospital. He was incapacitated for two months due to the accident.

On May 27, 1947, Menasco was awarded the Edison Medal at a presentation made by Oklahoma Gas and Electric Company's vice president, F. J. Meyer, at the company's annual party for employees of their southern division held at Ardmore, Okla.

PAUL WILLIS, lineman of the Texas Power and Light Company, who received the Edison Medal for the successful resuscitation of a fellow-worker.

F. I. WHALEY (second from right), holds the certificate for the Edison Medal awarded for a successful resuscitation that was presented to him at the annual Christmas banquet of the Texas Power and Light Co.

PAUL WILLIS
Texas

In the late afternoon of May 8, 1946, H. C. Hester, an apprentice lineman of the Texas Power and Light Company, was working with Paul Willis, lineman on a pole in Tyler, Texas. After the two had worked together in tying-in a 22-kv line at the top of the pole, they moved down to tie-in an energized 2400-v circuit.

Willis assumed a position on the southeast side of the pole and was preparing to tie-in the south circuit. Hester was buckled off across the crossarms, his left spur in the pole slightly above and between the double arms, with his right spur on the front side of the pole as a balance.

Willis smelled something burning, looked around and saw Hester lying across the conductors holding the outside conductor with his left hand. He was wearing only leather gloves. His left leg was between the double arms touching the bare section of the inside conductor. Willis attempted to remove him from the conductors but could not. He then cut his safety belt and, holding to one end, allowed him to roll over on his back onto the rubber hose—breaking contact with his hand and leg.

He called for help, then grasped Hester's belt and attempted artificial respiration similar to the prone pressure method. After several strokes Hester began gasping and before assistance arrived he began to breathe normally. When Willis lowered the injured man to the ground, with the assistance of C. L. Griffin and W. K. Cauthron, crewmen, foreman H. D. Golden immediately applied artificial respiration by the prone pressure method. With further assistance by S. E. Low normal breathing was restored and the injured man was removed to the hospital in an ambulance. As a result of the injury, Hester was threatened with the amputation of his left arm near the shoulder.

The Edison Medal was awarded to Paul Willis at the annual Christmas banquet of the Texas Power and Light Company at Dallas, Texas, in December 1946.

RICHARD GORDON
New Jersey

Two days after Christmas, 1946, a line crew of the Atlantic City Power Company, under the supervision of J. F. Shockey, was attempting to locate the fault in two 22-kv cables which were paralleled and made up the Missouri Plant-Baltic Sub feeder in Atlantic City, N. J. Two exploration holes had been dug, locating the general direction of the cable run. The cables were enclosed in terra-cotta pipe filled with pitch.

Late that afternoon, Ed Brangenberg, apprentice electrician, was digging a third exploration hole at a point where a pile of plastering sand had been stored, with a steam line down in the sand. After the sand had been removed, the crew started to dig in an effort to locate the cable fault. As they began to dig, the heat of the ground and the escaping vapor was so intense that a portable blower was brought out from the plant. At the time, P. Cohen and G. Bessinger were kneeling on the ground, holding the blower and directing the blast of air into the hole so as to blow out the vapor in order to facilitate visibility on the job.

Brangenberg was digging with a short shovel and struck a piece of board which he thought covered the cables. Shockey told him that they were covered with terra-cotta and that he was not down deep enough to hit them yet. Brangenberg then laid down his shovel, and passed the piece of board to another worker. He then leaned over, presumably to pick up his shovel, and, in some way, hit one of the 4-kv feeder cables. As he leaned there was a flash, he screamed and jumped, throwing his shovel, which landed behind him. He then collapsed.

Bessinger, Cohen and Shockey pulled him out of the hole and laid him on the ground. Richard Gordon immediately began artificial respiration by the prone pressure method, assisted by fellow workers, and continued for about ten minutes before the victim showed signs of recovery. He was then placed in an ambulance and taken to the hospital.

Mr. Gordon, who has since left the company, was awarded the Edison Medal, which was forwarded to him by B. L. England, vice president and general manager of the company.

F. I. WHALEY
Texas

On the afternoon of January 13, 1947, a Texas Power and Light Company linecrew under foreman F. I. Whaley were instructed to remove a 7200-v transformer from a pole near Sherman, Texas. They were to repair it, re-install it on the pole and check the meter. The crew were Claude Anderson, W. H. Brooks and O. H. Roberson.

The transformer had been removed and repaired and Anderson went back up the pole to replace the transformer. Before he got into position on the pole, his right hand came in contact with a 7200-v wire. He was thrown 23 ft to the ground.

Within a matter of seconds Whaley had him in position and began applying artificial respiration by the prone pressure method. Whaley sent truck driver Brooks back to Sherman for an ambulance while Roberson remained to assist him.

After 25 minutes Anderson was able to breathe normally. He was removed to the Wilson N. Jones Hospital, where he was treated for burns on both hands, left wrist,

F. C. Hogg (center), Edison Medal winner, is congratulated by H. W. Tice, vice-president of the Southern California Edison Co., Ltd. H. F. Woodruff (left) and R. Anderson (right) received certificates of assistance for their parts in saving the life of fellow-worker W. C. Rogers (second from right).

M. G. Spaller (second from right) receives the congratulations of H. W. Tice, vice-president of the Southern California Edison Co., Ltd., on receiving the Edison Medal for saving the life of Robert W. Lane (center). Safety supervisors, H. Miller (left) and C. A. Fischback (right) look on.

left shoulder and right leg. It was presumed that he did not hear Whaley's warning calls to watch out for the wire. This was determined by the fact that a high wind was blowing at the time of the accident. It was also discovered that Whaley did not use the correct protective grounding equipment.

The Edison Medal was presented to Mr. Whaley at the Texas Power & Light Co. annual Christmas party for employees held in the dining room of the Hotel Grayson, Sherman, Texas, on Dec. 22, 1947.

F. C. HOGG
California

On the morning of January 18, 1947, a line crew of the Southern California Edison Company, Ltd., under J. B. Wilkinson, was finishing installation of a 2/0 feeder which had been strung in to feed a large housing project in Long Beach, California.

A single phase No. 4-4kv circuit to furnish temporary lights and power had previously been run in. These two temporary wires were placed on the two end positions of the second arm down from the top of the pole. The new feeder had been strung in with the 3-phase wires on the top line arm, and the neutral wire in the pole position on the second line arm. Wilkinson sent C. W. Rogers and R. Anderson up the corner pole to run the corner taps, and H. F. Woodruff went up a pole 50 ft away, where the wires were dead-ended in both directions. The span between these two poles was slack because of inability to install a down guy on the corner pole.

Woodruff was reaching across the top of the double arm, and Rogers and Anderson had finished running their taps, when it became necessary to remove the slack span of the temporary No. 4 neutral. Wilkinson explained to his men that there were two transformers on the end of the line and that No. 4 neutral was not grounded in the end section. He further explained that it would be energized as the feedback through the transformers. He warned them to stay clear until they were able to open the neutral between the point where they were working and the transformers. He then called Anderson to come with him and open this neutral. They arrived at a point 400 ft from the corner pole when they heard a shout, looked back and realized that Rogers was in trouble. In some way he had contacted the ungrounded neutral wire with his hand while his left thigh was in contact with the new neutral wire.

Woodruff came down his pole, was first to reach Rogers and freed him from the circuit. Fred Hogg and Anderson followed Woodruff up the pole and the three of them got Rogers into position for pole-top resuscitation. He was not breathing and they could feel no pulse. After working on him for about ten minutes he began to breathe but stopped when they discontinued the artificial respiration. Soon an ambulance arrived and oxygen and a mask were sent up the pole and administered to him until he could be removed from pole to the ambulance. He was then taken to the hospital, where it was thought he might have to suffer loss of his left thumb.

The Edison Medal was presented to Mr. Hogg and certificates of assistance to Harold F. Woodruff and R. Anderson on December 18, 1947, at the Long Beach district office of the Southern California Edison Company by H. W. Tice, vice-president. The Long Beach *Press Telegram* reported the ceremony on December 30, 1947.

MERWIN G. SPALLER
California

On the morning of January 8, 1947, a line-crew of the Southern California Edison Company, Ltd., under the supervision of Charles Fishel was working on a new 2/0-4 kv feeder in Whittier, California. While doing the work, it was necessary to place a 5/16 in. span-guy parallel with a 4-kv feedback. Lineman Robert W. Lane was on the corner pole to which the top end of the guy was to be attached; H. H. Turner was on the first pole east, to which the other end of the guy was to be pulled. The guy was to be pulled over a large tree and also some telephone drops.

Lane was standing on a double arm above the level of the 4-kv feedback which was covered with rubber hose. The men pulled the guy up over tree and drops and up to Lane, who told them he had the guy and to slack off. They did.

Fishel was about a span west of the pole Lane was on when he saw that in some way Lane had made contact with the 4-kv feedback outside the rubber hose. Turner pulled the guy from Lane's hand and broke contact, and Lane slumped down in his safety belt. Lineman Merwin G. Spaller climbed to Lane's rescue, at which time Turner was coming from his pole to assist Spaller. Spaller was unable to clear Lane from the double arm and so was forced to administer artificial respiration by the pole top method—using only one hand. This was successful after 15 or 20 motions. Lane started to groan and came to. At this time Turner had the harness on the victim and he was lowered to the ground.

He was then taken to the hospital, where it became necessary to amputate his right hand.

Mr. Spaller was presented the Edison Medal December 17, 1947, at the Southern California Edison Company's Whittier, California, district office by H. W. Tice, vice-president. The presentation was reported by the *Whittier News* of December 19, 1947.

PAUL L. BAILEY
Virginia

Early on the morning of July 2, 1946, in Roanoke, Virginia, Lineman John W. Stiff, Jr., of the Appalachian Electric Power Company, was climbing from a 4000-v transformer platform to a pole. In some way he misjudged the distance to the bottom of the hot fuse holder hanging down and when

he raised his head to see how close he was he struck the fuse holder with his face and fell to the ground.

Foreman W. C. Carper, who was walking from a position north of the transformer platform to a position south of the platform where he could watch Stiff work, heard the arc and saw the victim fall clear of the circuit. The current had passed through his head and face to his right foot. As he lay on the ground, unconscious and showing no signs of breathing, his face turned blue. About twenty seconds after he fell from the pole, general foreman Paul Bailey, at the scene at the time, began artificial respiration by the prone pressure method. In about three or four minutes, the victim showed signs of normal breathing and in another minute he was able to breathe without assistance.

Carper held Stiff's head clear of the rocks and surrounding rubble while Bailey administered the artificial respiration. Shortly after, an ambulance from the Roanoke Hospital arrived. At the hospital Stiff was treated for burns of the face and hemorrhage of the right eye.

Mr. Bailey was presented with the Edison Medal by D. C. Duncan, system safety director for the Appalachian Electric Power Company at a foremen's dinner held February 8, 1947, at the Hotel Patrick Henry in Richmond, Virginia. An account of the rescue and the presentation was carried in the *Roanoke Times* of the same date.

PAUL L. BAILEY receives the Edison Medal and certificate from D. C. Duncan, system safety director of the Appalachian Electric Power Company as J. L. White, District manager (left) and J. W. Stiff (right), whose life was saved, look on.

CLIFFTON KENNEDY
Texas

Early in the morning of May 19, 1946, a line crew of the Southwestern Gas and Electric Company under foreman Frank Beaty was repairing storm damage in the town of Mt. Pleasant, Texas. Primary conductors of a 2400-v normally ungrounded circuit had been broken.

One of the conductors had been sent up to a lineman on one of the poles and on the ground nearby, linesman's helper Hubert D. Allen had the wire in his bare hands and was pulling to free it from a tree limb on which it had caught. As the lineman on the pole was tying the wire temporarily to the crossarm, one end of it touched a live operating primary on the other side of the pole. Partial grounding of circuits elsewhere, as a consequence of wet conditions and fallen trees, provided an exceptionally low resistance path to the other side of the circuit and Allen received a shock which suspended respiration.

As the lineman on the pole dropped the wire that had become energized Allen dropped to the ground and artificial respiration was begun within one minute by truck driver Cliffton Kennedy. Foreman Beaty, linemen J. B. Edwards, T. C. McFearin and C. C. Almond rendered assistance in keeping the patient warm by rubbing to promote circulation. Allen showed signs of the return of normal breathing in 2 to 3 minutes and 10 to 12 minutes later his respiration was natural and he was able to breathe without assistance.

14th Annual

E.E.I. SALES CONFERENCE

Edgewater Beach Hotel, Chicago, Ill.

APRIL 6-8, 1948

Featuring:

- *April 6th*—Four meetings on Residential, Rural, Commercial and Industrial sales, of interest to everyone concerned with the coming need to increase utility revenues.
- *April 7-8*—General Sessions, with an impressive list of authoritative speakers, who will discuss problems of major importance to the commercial future of our industry.
- *April 8th*—Mr. Charles E. Wilson, President, General Electric Company, will address the closing luncheon session.

Reservations should be made as early as possible with P. J. Weber, Resident-Manager, Edgewater Beach Hotel.

Electrical Equipment Committee Meeting

C. A. Corney, *Chairman*

THE forty-fourth meeting of the Electrical Equipment Committee was held on February 12 and 13 at the Netherlands-Plaza Hotel, Cincinnati, Ohio, and was attended by over 65 members and guests.

Closed Session

Apparatus troubles, their nature, cause, and prevention, was the highlight of the Closed Session of the Committee, which was held the morning and early afternoon of the first day. At the end of each description of specific troubles, a lively round table discussion, led by F. S. Brown, Sponsor for Apparatus Troubles, ensued. These discussions have been found to be very worthwhile to the members since most types of troubles described concern equipment and installations commonly used by many electric utilities.

R. W. Wilbraham reported on the recent activities of the AEIC-EEI-NEMA Joint Committee on Power Circuit Breakers. He requested suggestions and guidance of the Committee concerning several items now being considered by the Joint Committee in the preparation of tentative Power Circuit Breaker ratings.

B. Van Ness, Jr., reported on a carrier system for remote tripping on 220-kv circuits. He outlined the method of operation of the carrier circuits and difficulties encountered in its application. Frequency modulation was found preferable to normal amplitude modulation for this installation.

S. M. Hamill, Jr., gave a detailed analysis of the separation of major interconnected systems which occurred last year. Considerable discussion resulted which primarily was concerned with measures that might be applied to minimize similar disturbances on interconnected systems.

New equipment being purchased of particular interest was described by several of the members. The reasons for deciding upon particular designs was outlined for some of the more unusual items.

Open Session

"The Inspection, Testing, and Maintenance of Electrical Equipment for Stations and Substations" was the subject of a comprehensive paper by A. C. Baumann and R. H. Mertz. This paper is reproduced on page 47 in this issue of the BULLETIN.

R. F. Brower gave an interesting description of "System Planning Applicable to Consolidated Edison Company." Included was a summary of major factors affecting the design of the system. The load on the system is comprised largely of small customers in a congested area and planning is predicated on this load being of a non-interruptible nature. The system is planned as being unified yet will consist of twenty areas, each relatively independent of the other. This, it is believed will eliminate re-energizing difficulties in the event of a major catastrophe.

A large increase in system capacity was made by installation of topping units. Topping units were selected to gain economies in high-pressure installations, to provide additional 60-cycle capacity and to realize the economies associated with the steam requirements of the New York Steam Company which distributes a large steam load in several areas in Manhattan. This steam demand amounts to about 8,000,000 lb per hr on a cold morning. By installing topping units, the exhaust steam could be used to supply the steam load at times when it was not required for electric production, thereby producing outstanding economies in the supply of steam.

"Load Forecasting Methods Developed by Public Service Electric and Gas Co." was the subject of a paper prepared by Margaret R. Hansen and presented by T. Seely. In 1923 a Load Development Committee was organized by the Company. The Committee consists of representatives of the Generation, Sales and Distribution Departments. In addition to preparing special reports as may be necessary, it published regular forecasts twice each year. Long-range and near-term forecasts are made in each instance. The near-term estimates have been found to be greatly influenced by the level of business activity so that the current and prospective business condition need to be evaluated. The relatively stable load factor of the system permits correlation between forecasts of kilowatthour output and the maximum kilowatt load.

The preparation of 24-hour load curves each month for each substation permits the annual peak for each substation to be forecast. The substation loads are correlated with estimates of system load.

The load estimates are checked continually against actual loads. Charts were presented which indicated that in recent years the forecasts have been unusually accurate.

W. T. Rogers gave a discussion of "Safety Considerations in Substation and Power Station Design." Mr. Rogers emphasized that while most accidents on electric systems are the result of unsafe acts, many are caused by unsafe conditions. There are not only accident prone employees, there are accident prone conditions. A number of safety considerations in the electrical design of stations was outlined, along with recommendations for a long range program to improve safety conditions and practices.

H. P. Seelye gave a progress report on the work of the Joint EEI-NEMA Committee on Preferred Voltage Ratings for A-C Systems and Equipment. He mentioned that comments received since issuing the interim and preliminary reports last year had been carefully considered and appropriate revisions made. Editing of the final report which will include the entire voltage range is now underway and will soon be distributed for letter ballot. He emphasized that the Committee did not establish standards but made recommendations in regard to voltage ratings to other Committees which establish standards. He expressed the hope that the material in the report will be utilized by the industry so that the maximum benefits will accrue.

L. Birckhead reported on the preliminary results of a survey made to determine operating practices for hydrogen-cooled generators operating at pressures in excess of one half pound. The replies indicate four reasons of equal importance are responsible for operation at higher pressures. These are: To reduce temperature at rated load; to increase kilowatt output; to increase kilovars available; and to increase kilowatts and kilovars available. The data indicated that hydrogen losses for machines operating at five pounds will be approximately twice that at one-half pound and the losses at fifteen pounds will average about three times that at one-half pound. The survey indicated that hydrogen cooling at higher pressures was practicable but that some modifications in the cooling system need to be made to prevent dangerous accumulations of hydrogen in the cooling water system or main oil tank.

F. S. Brown gave a brief report on the results of tests conducted by Westinghouse Electric Co. on a Siemens Schuckert Circuit Breaker which was witnessed by several members of the Committee. The breaker was of the "oil-poor" type and its operation and performance did not indicate that it was superior to designs in this country for similar voltage and current ratings.

"Electric Design Features of 100,000-kw, 3600-rpm Turbine Generator Addition to Essex Plant" was described by E. H. Snyder. The unit was selected to replace a 22,500-kw low-pressure unit. The same space occupied by the low-pressure unit was utilized with minimum alterations to the building.

Totally-enclosed, induced draft fans were located on the roof of the plant to avoid extensive changes. As far as possible, existing step-up transformers and switchgear were utilized.

E. S. Fitz reported for W. C. Bowen on the formation of the Storage Battery Operation and Maintenance Group. Five members comprise the group and plans are being made for undertaking study of several subjects of interest to the Committee at this time.

L. Birckhead gave the results of a survey to determine the type of cooling preferred for 15,000-kw and 11,500-kw generators: hydrogen cooling is preferred for the 15,000-kw unit and air cooling for the smaller unit.

Meter and Service Committee Meeting

W. G. Knickerbocker, *Chairman*

OKLAHOMA CITY was the scene of the 33rd meeting of the Meter and Service Committee on February 9, 10 and 11. The AEIC Committee on Metering and Service Methods met during this same period. In addition to a nearly complete attendance of members, there were present twenty-two metermen from the Missouri Valley and the Southwestern Metermen's Associations.

This Committee finds that its policy of inviting to the general meeting, metermen who may not be members and who are located in the general area in which the meeting is held, is a good one. There is much of benefit to the Committee and to the visitor from this practice. The visiting metermen are encouraged to express their views and to make known any practices peculiar to their regions, for by knowing of these things the Committee can better represent metering and service practices on a nationwide basis.

Several important subjects have been under study for some time and at this meeting agreement was reached on the revision of Specification MS-4 (Indicating and Cumulative Demand Register Scales). This proposed specification will now be forwarded to the Joint EEI-AEIC-NEMA Committee for final preparation before publication. Also, with the exception of one detail, which should be easily resolved, agreement was reached on the first part of a Specification for Type-S Meter Mountings.

Other subjects are under study which will lead to additional specifications. All of this work should result in more uniform practices in operation and the use of more standardized products with monetary benefit to the industry.

Exceptionally good progress has been made in editing the Handbook for Electrical Metermen. The fifth edition is long since out of print and it is now expected that the sixth edition will be ready for printing about mid-year.

In order to encourage participation on the part of both members and visitors, the first day was entirely occupied with subject subcommittee meetings with schedules set up so as to have as little overlap and conflict as possible. All present were invited to sit in any of these meetings in which they might have a direct interest and make their wishes known. If this is consistently done, then the Meter and Service Committee will be more nearly successful in representing nationally those engaged in meter and service work.

The next meeting will be held at Lafayette, Indiana, on May 24, 25 and 26 and the Association of Edison Illuminating Companies Committee on Metering and Service Methods will meet during this same period.

Accident Prevention Committee Meeting

E. J. Kreh, *Chairman*

THE thirty-seventh meeting of the Accident Prevention Committee was held on February 16 and 17 at the Roosevelt Hotel in Pittsburgh with 48 members and guests in attendance.

W. R. Smith reported that the accident prevention manual "The Application and Care of Rubber Protective Equipment," is now in the process of printing.

P. L. G. Haaskarl reported completion of a questionnaire on hot line tool practices to be used for collecting data for the proposed accident prevention manual "The Use and Care of Live Line Equipment." The Transmission and Distribution Committee will collaborate with the Accident Prevention Committee in preparation of this manual.

Sixteen of the 662 fatal accidents in the industry reported during the six-year period 1941-1946, inclusive, occurred while hot line work was being performed and D. C. Stewart presented descriptions of each of these accidents. It is of interest to note that four of the cases resulted from accidental energization of crossarm braces by tie wires and that none were due to defective tools.

H. O. Sprinkle announced that a preliminary issue of the revised booklet "The Fireman and Electrical Equipment" now has been published by the Michigan State Board of Control for Vocational Education. This publication is intended as a textbook for firemen and is suitable for distribution by utilities to local fire departments. Sample copies will be sent to utility safety directors together with instructions for ordering additional copies.

W. R. Smith reported that his study of the more than 200 successful cases of resuscitation reported to the Edison Electric Institute in connection with the Edison Medal Award soon will be published.

A sound slide film produced by the Wisconsin Public Service Corporation entitled "Safe Use of Ladders" was presented by C. B. Boulet. This film shows accidents which have actually occurred due to the misuse of ladders as well as other common mistakes likely to result in accidents.

J. T. Witt described an aluminum extension ladder designed by the Duquesne Light Company particularly for use in stringing or maintaining transmission lines on steel towers. The ladder has a swivel base which may be fastened to the tower so that it may be used in almost any position. Mr. Witt then showed movies of

(*Continued on page* 64)

PERSONALS

President George H. Blake has announced the election of DONALD C. LUCE to be vice president in charge of electric operation, and the appointment of WATSON F. TAIT, JR., to be general manager of the Electric Department, Public Service Electric and Gas Company. Mr. Luce and WILLIAM H. BLAKE were elected members of the Boards of Directors of Public Service Electric and Gas Company and Public Service transportation companies. Mr. Blake is general solicitor of these companies.

JACOB BARRON has been named vice president in charge of combined operations of Public Service Corp. of New Jersey, a position recently created by the board of directors. He had been vice president in charge of electric operations since 1935 and for the past year was in charge of the operating committee. In his new capacity, he will be in charge of gas and transportation in addition to electric. He has also been elected to the same posts with the Public Service Electric & Gas Co. and Public Service transportation companies.

LYLE MCDONALD, formerly vice president and controller, has been made vice president in charge of finance. He assumed the duties of the office vacated by Percy S. Young, when he was named chairman of the executive committee several years ago. Mr. Young had retired as an officer in December. Mr. McDonald has also been elected to hold similar posts with the Public Service Electric & Gas Co. and Public Service transportation companies.

JOSEPH T. FOSTER was appointed a member of the executive committee of Public Service Electric and Gas Company and Public Service transportation companies. Mr. Foster is vice president in charge of real estate and purchases for these companies.

These other changes in organization were also announced by Mr. Blake: FRANKLYN HEYDECKE, appointed comptroller; F. WARREN COOPER, appointed assistant comptroller, Public Service Electric and Gas Company. Mr. Heydecke was general auditor and Mr. Cooper assistant general auditor. They were appointed to the same posts, respectively, in the corporation.

In the Public Service transportation companies the following changes in organization were announced also by Mr. Blake. EDWARD A. TUSON appointed comptroller; C. FRED ROGGE, assistant comptroller. Mr. Tuson was general auditor and Mr. Rogge assistant general auditor.

Mr. Luce, who becomes vice president in charge of electric operation, has been general manager of the electric department of Public Service since April, 1942. He started with the company in 1924 as a cadet engineer, the same year he was graduated from Lehigh University. After various assignments in the electric departments of the company, he was made chief engineer at Kearny Electric Generating Station in 1935 and the following year was promoted to general superintendent of electric generation. Six years later he was made general manager of the electric department.

Mr. Tait, appointed general manager of the electric department, also started with Public Service as a cadet engineer in 1922. He is a graduate of Marietta College and Lehigh University. After various assignments in the company's electric generation and distribution departments, he was promoted to assistant general superintendent of electric distribution in 1938. He was appointed assistant general manager of the electric department in April, 1942.

LEO F. CHAMBERS has been elected vice president and treasurer of the Northern States Power Company of Minnesota. He was chosen to fill the vacancy caused by the recent advancement of BERNARD F. BRAHENEY to the position of president and general manager of the company. He entered the service of the company in 1912.

A. DEAN DUDLEY, vice president of the Central New York Power Corp., Syracuse, has retired. Mr. Dudley has rounded out 50 years of continuous service. As director of the company's commercial activities, Mr. Dudley was one of the pioneers in the development of the electric utility industry in Syracuse. In 1917 he was elected treasurer and assistant secretary of the Syracuse Lighting Company, Inc.; a vice president in 1930; and later that year, president. Following the merger of several companies, Mr. Dudley was elected a vice president and director of Central New York Power Corp.

MARSHALL MCK. KOCH has been appointed vice president and general superintendent of electric operations of the Public Service Company of Colorado, succeeding the late Floyd F. McCammon.

Mr. Koch has been associated with this company or related companies since 1914 when he was employed as a junior engineer. A graduate of Cornell University, he was engaged in power plant design work from 1916 until 1917 when he entered military service in World War I. Returning from the service, he was engaged in electric distribution engineering work until 1921. Mr. Koch was superintendent of the electric distribution department from 1921 until 1947 when he was advanced to the position of assistant general superintendent of electric operations.

WILL H. FISCHER has retired as vice president of the Southern California Edison Company. Mr. Fischer joined the utility as legislative representative in 1922.

THOMAS J. FLANAGAN has been elected vice president of New England Power Service Company, Boston. Formerly in the U. S. Internal Revenue service, he joined the company in 1929. He became supervisor of taxes in 1943.

FREDERICK G. HARRIMAN has been appointed safety manager for the company, succeeding John P. McCann, who retired on January 1, after a long and distinguished career in safety engineering. Mr. Harriman was graduated from Harvard University in 1915. He was connected with the Stone and Webster organization at Brockton and Rockland, Mass., in engineering and operating capacities. In 1929 he joined the Narragansett Electric Company, Providence, Rhode Island, soon becoming superintendent of distribution. He served in the U. S. Naval Reserve in World War I, and in World War II with WPB and OWU, becoming chief of the switchboard and transformer section, equipment production office. In 1945 he became safety assistant for the New England Power Service.

The Georgia Power Company has named C. S. HAMMOND, formerly assis-

tant to vice president C. A. Collier, assistant to President C. B. McManus. The promotions of three other employees in supervisory capacities were also announced.

GEORGE BRODNAX, JR., has been transferred from his position as manager of the Community Development Division to succeed Mr. Hammond. ROBERT WARDLE, JR., formerly sales supervisor of the Atlanta division, has been named to the position vacated by Mr. Brodnax. C. M. WALLACE, JR., has been promoted from division senior salesman, Atlanta, to division sales supervisor, succeeding Mr. Wardle.

In his new position, Mr. Hammond will have such duties as may be assigned to him by the president. A native of Atlanta, Mr. Hammond received his grammar and high school education in Americus. Soon after his graduation from Georgia Tech, where he received a B. S. Degree in Electrical Engineering, he joined the Georgia Railway and Power Company, a predecessor of the Georgia Power Company.

In the first World War Mr. Hammond entered the regular Army and served a total of eight and a half years, becoming a Captain in the Corps of Engineers. Upon his resignation from the Army in 1926 he joined the company as assistant to the commercial vice president.

Mr. Brodnax, assistant to Mr. Collier, was first employed by the company in 1925 as a sales engineer in the Atlanta division. He is a native of Walton county and attended Georgia Tech, where he majored in electrical engineering.

Mr. Wardle, who will direct the activities of the Community Development Division, is also a graduate of Georgia Tech, receiving his B. S. Degree in Civil Engineering there in 1934. Immediately following his graduation he joined the company as a clerk and has since held positions in the Lighting, Industrial Power and Merchandise Divisions of the Sales Department.

Mr. Wallace, who succeeds Mr. Wardle, joined the company in 1928 as a student engineer after graduating from Georgia Tech. He has held the positions of power salesman and division lighting engineer in Athens, Georgia, and industrial-lighting specialist and division lighting engineer in Atlanta.

HUBERT L. BROWN has been appointed assistant chief operating engineer of the Kansas City Power and Light Company, Kansas City, Mo. Mr. Brown joined the company in 1936.

GEORGE R. MARRS has been appointed treasurer of the Texas Power and Light Company, succeeding J. E. VAN HORN, retired. Mr. Marrs became identified with TP&L in 1924 and has been assistant vice president since 1933.

W. L. JONES, formerly treasurer of the St. Louis County Gas Company, has been appointed director of a newly organized department for economic development in the Union Electric Company. Mr. Jones has been associated with Union Electric for 27 years, first in the sales department, then as local manager at De Soto and St. Charles and finally with the St. Louis County Division. He held positions as sales manager of the county division, treasurer of St. Louis County Gas (which at the time was associated with Union Electric) and subsequently as assistant treasurer of Union Electric.

C. H. ZURHEIDE has been appointed project engineer in the substations department of the Union Electric Company, St. Louis, Missouri. He succeeds FRANKLIN P. ROBINSON, who has resigned to join the staff of the General Electric Atomic Research Project, Hanford, Wash. Mr. Zurheide was affiliated with the Laclede Power and Light Company when those properties were acquired by Union Electric in 1945. Mr. Robinson had been with Union Electric for more than 7 years.

A. H. HAMILTON, formerly general superintendent of distribution and construction, Northern States Power Company, Minneapolis, Minn., has been named construction assistant to the first vice president, H. C. Cummins. EARL EWALD, distribution office, has been appointed general superintendent of electrical distribution, assuming Mr. Hamilton's former duties as related to supervision of transmission and distribution functions of the electrical operations department.

Mr. Hamilton started with the company in 1915 in the special construction department. In 1940, he was made general superintendent of construction and in 1943, he was appointed general superintendent of distribution and construction. A few months later, he left the construction office to take direct charge of the electric distribution department.

Mr. Ewald became identified with Northern States in 1930 and after completing the Cadet Engineers' Training Course the following year, he was assigned to the distribution department where he remained until his transfer to the engineering department upon its organization in 1936. He returned to the distribution department in 1945.

R. C. HIENTON, director of the development division of the Cleveland Electric Illuminating Company, has been appointed industrial sales manager of the company. As director of the development division, Mr. Hienton has been a key figure in the campaign to encourage business and industry to locate or expand in Cleveland-Northeast Ohio. He will continue to direct the company's development division. Mr. Hienton has been in the sales department of the Cleveland utility for 20 years.

At the same time the appointment of H. A. LAWRENCE as commercial sales manager was announced. Mr. Lawrence joined the company in 1924 and has been supervisor of commercial sales since 1946.

LEONARD J. PRESSON has been elected vice president and a director of Western Massachusetts Electric Company, Springfield. He joined this utility in 1917 in the meter department. In 1921 he was transferred to the business office. He became assistant manager in 1930 of the then United Electric Light and manager of the Agawam and Ludlow utilities. January 1935 found him manager of the United company. On that company's consolidation with the Western utility in 1943 he was made manager of the Springfield division. In recent years Mr. Presson has had charge of industrial relations for the system.

WESLEY L. MITCHELL has been appointed manager of the Springfield division. He entered its service in the State Street generating plant as an electrician in 1927. In 1929 he was made rate engineer, becoming assistant manager in 1935. Mr. Mitchell has been chairman of the company's advertising committee for several years. RICHARD T. LOVETT, paymaster of the Springfield division since 1938, has been appointed assistant manager. He joined the company in 1920.

Accident Prevention Committee Meeting

(*Continued from page* 61)

actual use of the ladder in stringing a 3,100-ft. river crossing span. Several members reported difficulty in securing sufficiently sound wooden ladders and indicated an increased interest in the use of aluminum despite its greater cost.

Functions of the Industrial Relations Committee were described by its Chairman, C. B. Boulet. He emphasized the fact that both the Industrial Relations and Accident Prevention Committees deal with employee problems so that there are several fields of activity where coordination between the two committees is desirable. The inclusion of accident prevention features and provision for safety discipline in union agreements, training and the testing and selection of employees are all of common concern to both committees.

G. E. Balch outlined the project on standard packaging recently initiated by the Purchasing and Stores Committee to permit faster, safer and more efficient handling and storing of line hardware items. The goal of this program is the establishment of standard dimensioned package with uniform count for each item which will lend to speed and safety in handling, a package weight limit of 75 lb which will permit safe handling by one man and the development of a standard reclosing box which will eliminate the use of crates, cartons, barrels, kegs and bags and the need for hazardous steel bands, nails and staples.

Preliminary accident experience data for the second half of 1947 obtained from 25 companies represented on the Accident Prevention Committee and comprising about 35 per cent of the total manhours covered in the annual report for the entire industry were presented by W. F. Brown. A summary of these figures together with comparable data for the first half of 1947 are shown below:

	Jan.-June	July-Dec.
Manhours	84,256,489	103,780,293
Fatalities	15	29
Frequency Rate	11.0	10.5
Severity Rate	1.08	1.92

The data shows no significant change in the frequency of accidents during the year or from previous years, however, the serious increase in the severity rate for the second half of 1947 brings the rate for the entire year well above the 1946 rate for this same group of companies. This is almost entirely due to the unusually large number of fatalities occurring during the second half of 1947.

A round table discussion conducted by D. C. Duncan covered a wide variety of subjects. Hazards associated with the use of carbon tetrachloride were emphasized by the report of a serious case of poisoning to a man working near an area where it was being used for cleaning windings. R. H. Coleman described experience with breaks in linemen's climbers resulting from fatigue or forging cracks. This experience has resulted in a decision to eliminate regaffing. D. C. Stewart reported that his company is starting to use insulated climbers. P. L. G. Haaskarl outlined the hazards associated with erecting full length treated poles adjacent to live lines and described development of a pole guard to prevent contact with live lines during erection. This guard consists of a micarta hood fitted over the top of the pole and four 18-ft sections of switchstick mounted along the sides. R. P. Douglas described a guard for use on outdoor circuit breakers. The breakers are installed so that it is impossible to reach them without a ladder and the guard is installed so that it is impossible to climb past it. G. J. Ruoff pointed out the new hazard resulting from the erection of television and FM radio antenna arrays and the need for education of dealers and the public through local channels was expressed.

CONVENTIONS AND MEETINGS

1948

APRIL

5-8 National Association of Corrosion Engineers, Jefferson Hotel, St. Louis, Mo.
6-8 Fourteenth Annual Sales Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.
7-9 Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.
7-9 Midwest Power Conference, Sheraton Hotel, Chicago, Ill.
8-10 Southeastern Electric Exchange, Annual Conference, Boca Raton Club, Boca Raton, Florida.
12-14 National Conference of Electric and Gas Utility Accountants, New Jefferson Hotel, St. Louis, Mo.
13-14 Indiana Electric Association, Young Men's Utility Conference, Ipalco Hall, Indianapolis, Ind.
19-21 Purchasing and Stores Committee, EEI, Hotel Cleveland, Cleveland, Ohio.
27-29 Chamber of Commerce of the U. S. A., Washington, D. C.
28-29 Pennsylvania Electric Association, Electrical Equipment Committee, Hershey Hotel, Hershey, Pa.
28-30 Missouri Association of Public Utilities, Hotel Jefferson, St. Louis, Mo.

MAY

3-4 Electrical Equipment Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
3-4 Transmission and Distribution Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
3-7 National Electrical Wholesalers Association, Statler Hotel, Buffalo, N. Y.
4-5 Accident Prevention Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
4-5 Hydraulic Power Committee, EEI, Edgewater Beach Hotel, Chicago, Ill.
5-7 Missouri Valley Electric Association, Rural Round Table Discussion and Sales and Rural Conference, President Hotel, Kansas City, Mo.
7-9 Westinghouse Agent-Distributors Association, Hotel Statler, Buffalo, N. Y.
10-11 Prime Movers Committee, EEI, Muehlbach Hotel, Kansas City, Mo.
10-13 National Fire Protection Association, Statler Hotel, Washington, D. C.
13-14 Pennsylvania Electric Association, Systems Operation Committee, Castleton Hotel, New Castle, Pa.
18-21 National District Heating Association, Hotel Statler, St. Louis, Mo.
24-25 Meter and Service Committee, EEI, Lafayette, Indiana.
27-28 Missouri Valley Electric Association, Accounting Conference, (Place to be determined).
27-28 Public Utilities Advertising Association, Hotel Cleveland, Cleveland, Ohio.

JUNE

1-3 EDISON ELECTRIC INSTITUTE, Annual Convention, Atlantic City, N. J.
10-11 Pennsylvania Electric Association, Prime Movers Committee, Hotel Casey, Scranton, Pa.
14-15 Arkansas Utilities Association, Arlington Hotel, Hot Springs, Ark.
16-18 Pacific Coast Electrical Association, Inc., Hotel Fairmont, San Francisco, Cal.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

OFFICERS

C. E. OAKES, *President*.....Pennsylvania Power & Light Co., Allentown, Pa.
E. R. ACKER, *Vice President*.....Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.
H. S. BENNION, *Vice-President and Managing Director*.....420 Lexington Ave., New York, N. Y.
K. B. CRUMB, *Treasurer*.....American Gas & Electric Service Corp., New York, N. Y.
MAE B. WOODS, *Secretary*.....420 Lexington Avenue, New York, N. Y.

BOARD OF DIRECTORS

(Terms Expiring 1948)

H. B. BRYANS.....Philadelphia Electric Co., Philadelphia, Pa.
R. E. DILLON.....Boston Edison Co., Boston, Mass.
J. G. HOLTZCLAW.....Virginia Electric & Power Co., Richmond, Va.
R. H. KNOWLTON.....The Connecticut Light & Power Co., Hartford, Conn.
J. E. LOISEAU.....Public Service Company of Colorado, Denver, Colo.
FRANK MCLAUGHLIN.....Puget Sound Power & Light Co., Seattle, Wash.
W. C. MULLENDORE.....Southern California Edison Co., Los Angeles, Calif.
W. H. SAMMIS.....Ohio Edison Co., Akron, Ohio
PHILIP SPORN.....American Gas & Electric Service Corp., New York, N. Y.
L. V. SUTTON.....Carolina Power & Light Co., Raleigh, N. C.
E. S. THOMPSON.....The West Penn Electric Co. (Inc.), New York, N. Y.
G. W. VAN DERZEE.....Wisconsin Electric Power Co., Milwaukee, Wis.
JUSTIN R. WHITING.....The Commonwealth & Southern Corp., New York, N. Y.

(Terms Expiring 1949)

W. C. BECKJORD.....The Cincinnati Gas & Electric Co., Cincinnati, Ohio
W. H. BURKE.....Ebasco Services Inc., New York, N. Y.
A. H. KEHOE.....Consolidated Edison Company of New York, Inc., New York, N. Y.
FRANK KRUESI.....Central & South West Utilities Co., Wilmington, Del.
ELMER L. LINDSETH.....The Cleveland Electric Illuminating Co., Cleveland, Ohio
P. H. MCCANCE.....Duquesne Light Co., Pittsburgh, Pa.
C. E. MICHEL.....Union Electric Company of Missouri, St. Louis, Mo.
ALBERT T. O'NEILL.....Buffalo Niagara Electric Corp., Buffalo, N. Y.
J. W. PARKER.....The Detroit Edison Co., Detroit, Mich.
H. T. PRITCHARD.....Indianapolis Power & Light Co., Indianapolis, Ind.
K. M. ROBINSON.....The Washington Water Power Co., Spokane, Wash.
R. L. THOMAS.....Consolidated Gas Electric Light & Power Co., Baltimore, Md.
WILLIAM WEBSTER.....New England Electric System, Boston, Mass.
H. E. YOUNG.....Northern States Power Co., Minneapolis, Minn.

(Terms Expiring 1950)

E. R. ACKER.....Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.
AUSTIN D. BARNEY.....The Hartford Electric Light Co., Hartford, Conn.
E. F. BARRETT.....Long Island Lighting Co., Mineola, N. Y.
REX I. BROWN.....Mississippi Power & Light Co., Jackson, Miss.
HANCE H. CLELAND.....San Diego Gas & Electric Co., San Diego, Calif.
J. A. LONGLEY.....Central Illinois Light Co., Peoria, Ill.
L. A. MAGRAW.....Central Illinois Public Service Co., Springfield, Ill.
H. B. MUNSELL.....Kansas City Power & Light Co., Kansas City, Mo.
R. S. NELSON.....Gulf States Utilities Co., Beaumont, Texas
C. E. OAKES.....Pennsylvania Power & Light Co., Allentown, Pa.
B. F. PICKARD.....Interstate Power Co., Dubuque, Iowa
MCGREGOR SMITH.....Florida Power & Light Co., Miami, Fla.
A. C. SPURR.....Monongahela Power Co., Fairmont, W. Va.
O. TITUS.....Metropolitan Edison Co., Reading, Pa.

(Executive Committee)

The Executive Committee consists of the following members of the Board of Directors: Messrs. H. B. Bryans, W. H. Burke, R. E. Dillon, A. H. Kehoe, E. L. Lindseth, P. H. McCance, W. H. Sammis, L. V. Sutton.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

(Continued)

ADVISORY COMMITTEE

D. C. BARNES....Virginia Electric & Power Co., Box 431, Charlottesville, Va.

H. J. BAUER.....Southern California Edison Company, Los Angeles, Calif.

S. R. BERTRON
Houston Lighting & Power Co., Houston, Texas

J. B. BLACK
Pacific Gas and Electric Co., San Francisco, Calif.

CURTIS E. CALDER
Electric Bond and Share Co., New York, N. Y.

J. W. CARPENTER
Texas Power and Light Co., Dallas, Texas

SAMUEL FERGUSON
The Hartford Electric Light Co., Hartford, Conn.

J. F. FOGARTY..The North American Co., New York, N. Y.

H. P. LIVERSIDGE
Philadelphia Electric Co., Philadelphia, Pa.

B. W. LYNCH
San Diego Gas & Electric Co., San Diego, Calif.

E. J. MACHOLD
Niagara Hudson Power Corp., Syracuse, N. Y.

T. W. MARTIN...Alabama Power Co., Birmingham, Ala.

J. W. McAFEE
Union Electric Co. of Missouri, St. Louis, Mo.

IRWIN L. MOORE
New England Electric System, Boston, Mass.

GROVER C. NEFF
Wisconsin Power & Light Co., Madison, Wisc.

A. B. PATERSON
New Orleans Public Service Inc., New Orleans, La.

WILLIAM SCHMIDT, JR...Consolidated Gas Electric Light & Power Co., Baltimore, Md.

R. H. TAPSCOTT
Consolidated Edison Co. of N. Y., Inc., New York, N. Y.

GEORGE N. TIDD
American Gas & Electric Co., New York, N. Y.

J. V. TONER.....Boston Edison Co., Boston, Mass.

E. A. YATES
The Commonwealth & Southern Corp., New York, N. Y.

CHAIRMEN OF EDISON ELECTRIC INSTITUTE COMMITTEES (1947-1948)

ACCOUNTING

Accounting Division General, H. B. HARDWICK..... Consumers Power Co., Jackson, Mich.
Application of Accounting Principles, H. H. SCAFF.....Ebasco Services Inc., New York, N. Y.
Customer Activities, GLENN RAY.....Indianapolis Power & Light Co., Indianapolis, Ind.
Depreciation Accounting, A. H. KUHN.....Pioneer Service & Engineering Co., Chicago, Ill.
General Accounting, O. K. BOYD.....Consolidated Gas Electric Light & Power Co., Baltimore, Md.
Plant Accounting, L. C. PURSELL.....Pennsylvania Power & Light Co., Allentown, Pa.
Taxation, HERBERT S. HOWARD.....Niagara Hudson Power Corp., Syracuse, N. Y.

COMMERCIAL

Commercial Division General, RALPH P. WAGNER.....New York Power & Light Corp., Albany, N. Y.
Commercial Sales Section, J. S. SCHUCHERT.....Duquesne Light Co., Pittsburgh, Pa.
Farm Section, E. C. EASTER.....Alabama Power Co., Birmingham, Ala.
Industrial Power and Heating Section, J. R. HARTMAN.....The Cincinnati Gas & Electric Co., Cincinnati, Ohio
Residential Section, J. M. STEDMAN.....Pennsylvania Power & Light Co., Allentown, Pa.
Sales Personnel and Training, R. S. BELL.....The Commonwealth & Southern Corp., New York, N. Y.
Wiring and Specifications, R. F. HARTENSTEIN.....Ohio Edison Co., Akron, Ohio

ENGINEERING

Engineering Division General, P. H. CHASE.....Philadelphia Electric Co., Philadelphia, Pa.
Electrical Equipment, CHESTER A. CORNEY.....Boston Edison Co., Boston, Mass.
Hydraulic Power, G. R. STRANDBERG.....Stone & Webster Engineering Corp., Boston, Mass.
Meter and Service, W. G. KNICKERBOCKER.....The Detroit Edison Co., Detroit, Mich.
Prime Movers, G. C. DANIELS.....The Commonwealth & Southern Corp., Jackson, Mich.
Transmission and Distribution, THOMAS J. BROSNAN.....Buffalo Niagara Electric Corp., Buffalo, N. Y.

GENERAL

Accident Prevention, E. J. KREH.....Duquesne Light Co., Pittsburgh, Pa.
Industrial Relations, C. B. BOULET.....Wisconsin Public Service Corp., Milwaukee, Wis.
Insurance, I. M. CARPENTER.....Ebasco Services Inc., New York, N. Y.
Membership, J. F. FOGARTY.....The North American Co., New York, N. Y.
Purchasing and Stores, R. S. KING.....Union Electric Company of Missouri, St. Louis, Mo.
Prize Awards, H. M. SAWYER.....American Gas & Electric Service Corp., New York, N. Y.
Rate Research, E. N. STRAIT.....Pioneer Service & Engineering Co., Chicago, Ill.
Statistical, WINSOR MARTIN.....Pioneer Service & Engineering Co., Chicago, Ill.
Transportation, JEAN Y. RAY.....Virginia Electric & Power Co., Richmond, Va.
Codes and Standards (a Subcommittee of the Board of Directors), H. B. BRYANS..Philadelphia Electric Co., Philadelphia, Pa.